

YAMAHA NETWORK BOARD **SRCD/SRCP**
ERCX/SRCX/DRCX

DeviceNet

User's Manual

ENGLISH 

YAMAHA MOTOR CO., LTD.

IM Operations

882 Soude, Naka-ku, Hamamatsu, Shizuoka 435-0054.Japan
URL <http://www.yamaha-motor.jp/robot/index.html>

E73-Ver. 3.02

INTRODUCTION

Thank you for purchasing the DeviceNet unit for the YAMAHA single-axis/dual-axis robot controllers SRCP/SRCD/ERCX/SRCX/DRCX series.

This is an optional unit to allow connecting YAMAHA single-axis/dual-axis robot controllers SRCP/SRCD/ERCX/SRCX/DRCX series (hereafter called "controller") to the widely used DeviceNet which is a de facto standard for FA (factory automation) field network.

This manual describes typical examples for taking safety measures, installing wiring, making machine settings and operating the machine to ensure that the DeviceNet unit is used safely and effectively. After reading this manual keep it in a safe, easily accessible location, so it can be referred to whenever needed. When moving this unit, always make sure this manual accompanies it, and make sure that the person who will actually use this DeviceNet unit reads this manual thoroughly.

This manual only contains information involving the DeviceNet unit. Please refer to the controller user's manual for information about basic controller operation and programming, etc.

The HPB screen displays in this manual are for the DRCX series controllers (hereafter called "dual-axis controller") and so may differ somewhat from the HPB screen display for the SRCP/SRCD/ERCX/SRCX series controllers (hereafter called "single-axis controller"). Please note that this will cause no problem with the functions of the controller or DeviceNet unit.

CAUTION

- The contents of this manual may be changed in advance without prior notice.
 - Every effort was made to ensure the contents of this manual are complete, however please contact us if errors, ambiguities or possible trouble points are found.
 - This manual does not constitute a warranty of industrial rights or other rights nor a concession of utility rights. Further, no responsibility whatsoever is accepted for problems arising from use of the information contents listed in this manual.
-

MEMO

Contents

Cautions To Ensure Safety	1
1-1 Basic safety points	2
1-2 System design safety points	2
1-3 Installation and wiring safety points	3
1-4 Start-up and maintenance safety points	4
1-5 Precautions when disposing of the unit	4
1-6 Warranty	5
 DeviceNet Unit	 7
2-1 DeviceNet unit features	8
2-2 How the DeviceNet system works	9
2-3 DeviceNet cable connections	10
2-4 Parallel I/O connector	11
2-5 Controller system settings (Slave station)	13
2-5-1 Validating the DeviceNet unit	13
2-5-2 Setting MAC ID and communication speed	14
2-5-3 How to check MAC ID and communication speed	15
2-6 Sequencer (master station) settings	16
2-6-1 Exchanging data with the controller	16
2-7 I/O information	17
2-7-1 Profile (I/O signal table)	17
2-7-2 Dedicated command inputs	18
2-7-3 General-purpose inputs (SI200 - SI215)	22
2-7-4 Interlock (LOCK)	23
2-7-5 Emergency stop input (EMG)	23
2-7-6 Service mode (SVCE)	24
2-7-7 Custom outputs	25
2-7-8 General-purpose outputs (SO200 - SO215)	26
2-8 Timing chart	27
2-8-1 Right after controller power turns on	27
2-8-2 Custom input command execution	28
2-8-3 When interlock signal is input	32
2-8-4 When emergency stop signal is input	33
2-8-5 When an alarm is issued	34
2-8-6 When point movement commands are run	35
2-9 I/O assignment change function	36
2-9-1 Changing the I/O assignment	36
2-9-2 I/O assignment list	37
2-9-3 I/O assignment selection parameter description	39
2-9-4 I/O signal description	41
2-9-5 Timing chart	46
2-10 Robot language	56
2-10-1 MOVF	56
2-10-2 JMPF	57
2-10-3 JMPB	58
2-10-4 DO	58
2-10-5 WAIT	59
2-11 Emulated Serialization on parallel DIO	60
2-12 Other operations	62
2-12-1 Serial I/O display	62
2-12-2 Manual control of general-purpose output	63

2-13 Error message	64
2-14 Troubleshooting	65
2-15 Specifications	67
2-15-1 Unit basic specifications	67
2-15-2 DeviceNet specifications	68
2-16 Supplement	74
2-16-1 EDS files	74

CHAPTER

1

Cautions To Ensure Safety



1-1 Basic safety points

Besides reading this instruction manual and the controller user's manual, also be sure to handle the equipment correctly while paying sufficient attention to safety.

Points regarding safety in this instruction manual only list items involving this product. Please refer to the controller instruction manual for information regarding safety when using this unit with the controller.

It is not possible to detail all safety items within the limited space of this manual. So it is essential that the user have a full knowledge of basic safety rules and also that the operator makes correct judgments on safety procedures during operation.

Industrial robots are highly programmable, mechanical devices that provide a large degree of freedom when performing various manipulative tasks. Failure to take necessary safety measures or mishandling due to not following the instruction in this manual may result in trouble or damage to the robot and injury to personnel (robot operator or service personnel) including fatal accidents.

Important caution points in this manual are from hereon indicated by the term:



1-2 System design safety points



When communication errors occur in the DeviceNet system, check the status of the network system and the controller beforehand by referring to the DeviceNet instruction manual and this instruction manual. Also use this communication status information to contrive circuits and interlocks in the sequence program so that the system including the controller will operate safely.



Emergency stop signals may sometimes interrupt register operation in the DeviceNet unit, however this is merely a software control process and is in no way a problem. Therefore, we strongly advise contriving a hardware interlock circuit connected to the emergency stop pin contacts in the parallel I/O of the controller.



Do not bundle control lines or communication cables together or in close contact with main circuit or motor/actuator lines. As a general rule, maintain a gap of at least 100mm. Noise in signal lines may cause faulty operation.

1-3 Installation and wiring safety points

⚠ CAUTION

Always cut off all power to the controller and the overall system before attempting installation or wiring jobs. This will prevent possible electrical shocks.

After the controller has been on for a while, some points in the controller may be extremely hot or remain at high voltages. After cutting off the power when installing or removing the unit, wait at least 5 minutes before starting work.

⚠ CAUTION

Always uses the system specifications as listed in the controller instruction manual during installation or wiring work on the controller. Attempting to use other than these system specifications might cause electrical shocks, fire, faulty operation, product damage or deteriorated performance.

⚠ CAUTION

Securely install the connectors into the unit, and when wiring the connectors, make the crimp, contact or solder connections correctly, using the tool specified by the manufacturer. Poor connections will cause faulty operation.

⚠ CAUTION

When installing the unit, be careful not to directly touch any electronic components (except DIP switches) or parts conducting electrical current.

⚠ CAUTION

Make sure that foreign matter such as wiring debris or dust does not penetrate into the controller.

⚠ CAUTION

Always store network cable inside cable ducts or clamp them securely in place. Otherwise, excessive play or movement, or mistakenly pulling on the cable may damage the unit or cables, or poor cable contact may lead to faulty operation.

⚠ CAUTION

When detaching the cable, remove by holding the connector itself and not by tugging on the cable. Otherwise, removing by pulling on the cable itself may damage the unit or cables, or poor cable contact may lead to faulty operation.

1-4 Start-up and maintenance safety points

CAUTION

Never attempt to disassemble the robot or controller. When a robot or controller component must be repaired or replaced, contact us for details on how to perform the servicing.

CAUTION

Always cut off all power to the controller and the overall system before attempting maintenance or servicing. This will prevent possible electrical shocks.

After the controller has been on for a while, some points in the controller may be extremely hot or remain at high voltages. After cutting off the power when installing or removing the unit, wait at least 5 minutes before starting work.

CAUTION

Do not touch the terminals (or pins) while power is still applied to the unit. This may cause electrical shocks or faulty operation.

//

1-5 Precautions when disposing of the unit

CAUTION

This product must be properly handled as industrial waste when its disposal is required.

1-6 Warranty

For information on the warranty period and terms, please contact our distributor where you purchased the product.

This warranty does not cover any failure caused by:

1. Installation, wiring, connection to other control devices, operating methods, inspection or maintenance that does not comply with industry standards or instructions specified in the YAMAHA manual;
2. Usage that exceeded the specifications or standard performance shown in the YAMAHA manual;
3. Product usage other than intended by YAMAHA;
4. Storage, operating conditions and utilities that are outside the range specified in the manual;
5. Damage due to improper shipping or shipping methods;
6. Accident or collision damage;
7. Installation of other than genuine YAMAHA parts and/or accessories;
8. Modification to original parts or modifications not conforming to standard specifications designated by YAMAHA, including customizing performed by YAMAHA in compliance with distributor or customer requests;
9. Pollution, salt damage, condensation;
10. Fires or natural disasters such as earthquakes, tsunamis, lightning strikes, wind and flood damage, etc;
11. Breakdown due to causes other than the above that are not the fault or responsibility of YAMAHA;

The following cases are not covered under the warranty:

1. Products whose serial number or production date (month & year) cannot be verified.
2. Changes in software or internal data such as programs or points that were created or changed by the customer.
3. Products whose trouble cannot be reproduced or identified by YAMAHA.
4. Products utilized, for example, in radiological equipment, biological test equipment applications or for other purposes whose warranty repairs are judged as hazardous by YAMAHA.

THE WARRANTY STATED HEREIN PROVIDED BY YAMAHA ONLY COVERS DEFECTS IN PRODUCTS AND PARTS SOLD BY YAMAHA TO DISTRIBUTORS UNDER THIS AGREEMENT. ANY AND ALL OTHER WARRANTIES OR LIABILITIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXPRESSLY DISCLAIMED BY YAMAHA. MOREOVER, YAMAHA SHALL NOT BE HELD RESPONSIBLE FOR CONSEQUENT OR INDIRECT DAMAGES IN ANY MANNER RELATING TO THE PRODUCT.

MEMO

CHAPTER

2

DeviceNet Unit

2-1 DeviceNet unit features

DeviceNet is an FA field network developed by the Allen-Bradley Corporation in the USA. Technical rights to DeviceNet were later transferred to the ODVA (organization dedicated to the worldwide spread of DeviceNet). Use of DeviceNet specifications is now completely open to everyone and manufacturers both at home and overseas are developing products conforming to DeviceNet specifications. Different kinds of control device such as PLCs, PCs, sensors and actuators can all be easily connected to DeviceNet. Using DeviceNet allows eliminating the need for a lot of excess wiring, so wiring tasks are more efficient and installation and maintenance costs are reduced.

Main features of this DeviceNet unit are as follows:

- The controller can be connected to the DeviceNet system using this unit. This unit fits directly inside the controller and so does not require any extra installation space.
- The PLC is connected to the robot system using only one dedicated cable (with 5 wires). This allows the entire system wiring to be reduced and also makes wiring tasks faster and more efficient while reducing maintenance and installation costs.
- 16 points each of general-purpose input/output and 16 points each of custom input/output are available. The parallel I/O interface can of course be used as is.
- Emulated serialization on parallel I/O is available
All types of I/O equipment, such as sensors and relays, connected to the parallel I/O of the controller can be controlled from the PLC (sequencer) just as if connected to the I/O of the DeviceNet system and without using a robot program.

Refer to the particular service manual involved when detailed information on connecting to the master station PLC (sequencer) or on PLC (sequencer) programs is needed when using other equipment.

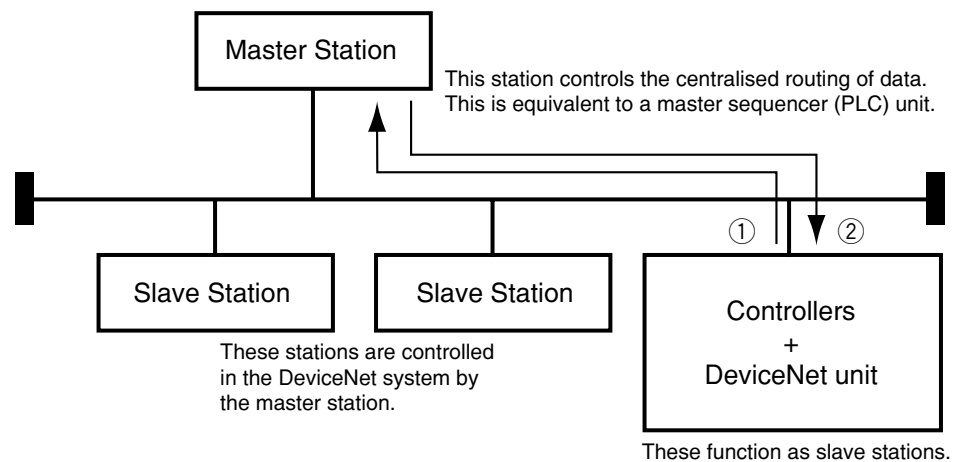
Refer to the controller instruction manual for information involving operating the controller unit and on robot programming.

* DeviceNet is a registered trademark of Open DeviceNet Vendor Association, Inc.(ODVA).

2-2 How the DeviceNet system works

This brief description of how data is exchanged will help to understand how the controller and sequencer (PLC) operate via the DeviceNet system.

Devices connected to the DeviceNet system are broadly grouped into master stations and slave stations according to their functions. The master station controls the centralized routing of data, much like the master unit of a PLC. The slave station is controlled by the master station and makes a data response when requested by the master station. The controllers connected to the DeviceNet unit function as slave stations and exchange I/O data with the master station.



① The controller on/off information is sent to the master station via the information network (DeviceNet system cable).

② Master station sequencer (PLC) on/off information is sent to the controller via the information network (DeviceNet system cable).

*The controller monitors on/off information at 10 millisecond intervals.

MEMO

The controllers connected to the DeviceNet unit operate as generic devices. The MAC ID settings and communication speed settings are made with a DIP switch on the board. (Checks of these settings are made on the HPB.) ON/OFF information handled by the DeviceNet unit comes through 16 points each of general-purpose I/O and 16 points each of custom I/O. ON/OFF information in the robot program is handled by DO statements, WAIT statements, and JMPB statements. (Serial input/outputs (I/O) for the DeviceNet are assigned using I/O numbers from 200 onwards.) Designated I/O ports can be controlled independently of the program by making emulated serialization settings on the parallel I/O.

2-3 DeviceNet cable connections

Wire the DeviceNet cable to the accessory DeviceNet plug. Make the wiring connections by referring to the drawing below or the marks on the plug. Make sure the connections are correct! When finished wiring the cable to the plug, connect it to the DeviceNet connector as shown below.

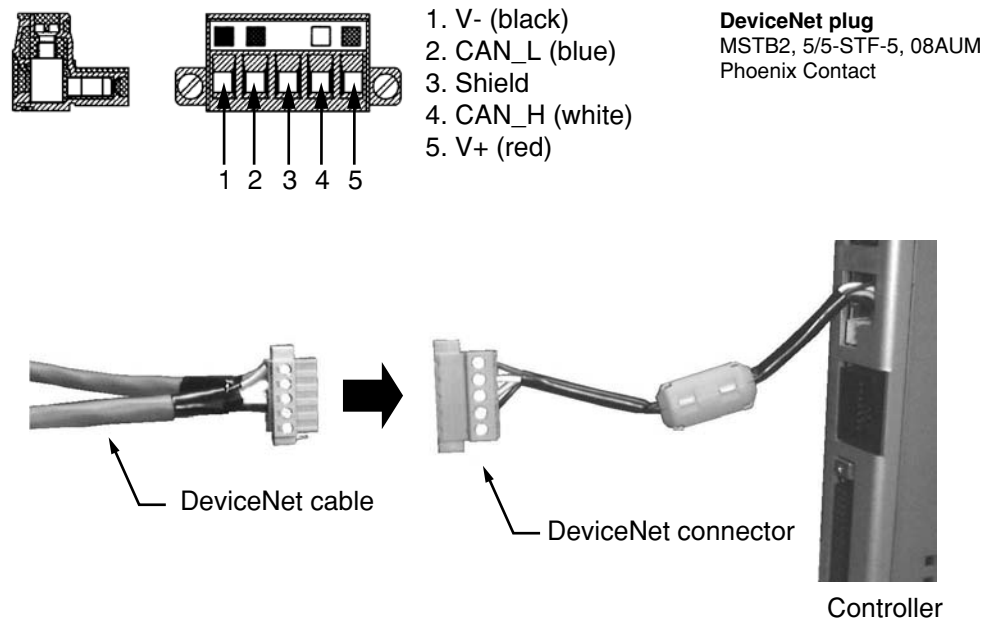


Fig. 2-1 DeviceNet cable wiring

* The 3 pins (shield) on the DeviceNet connector are not wired but this causes no problems during operation. These pins can be used if the customer wants a more secure ground connection.

CAUTION

Always cut off the power before making the above connections.

Clamp the cable in place so it will not come loose.

Be sure to put an excessive pulling or weight load on the cable when wiring or installing.

There are limits on the total cable length and the cable length between stations so always consult the instruction manual for the master station sequencer (PLC).

MEMO

Set MAC ID and communication speed before connecting the DeviceNet cables.
(See "2-5-2 Setting MAC ID and communication speed".)

2-4 Parallel I/O connector

The I/O connector must be wired into the controller so install as shown below even if not using the controller's parallel I/O.

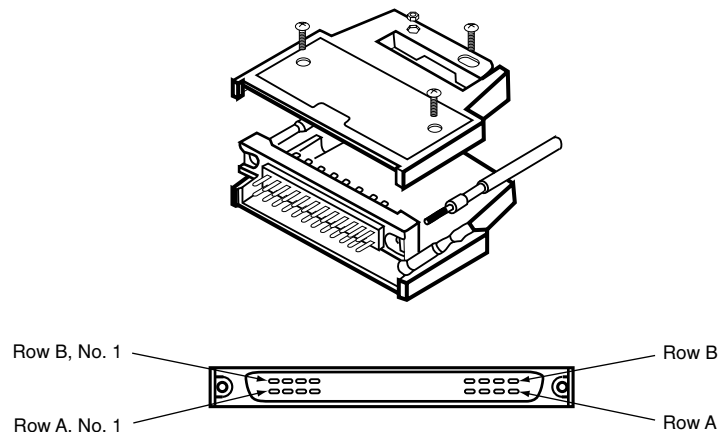
■ **When the ERCX/SRCX/DRCX series controllers are used:**

1. Short Pin No. A-24 (EMG 1) and B-24 (EMG 2).
2. Short Pin No. B-4 (LOCK) and A-15, to B-15 (0V).
3. Connect an external 24 volts to Pin No. A-13, B-13 (+IN COM).
(On DRCX and SRCX you can connect to A-14, B-14 (+24V) and to A-13, B-13 (+IN COM) instead of connecting to an external 24 volt supply.

If Step 1 is not completed, an emergency stop will occur. If Step 2 is not completed, an interlock will be applied. In either case, the controller cannot be operated (see Chapter 4).

Note that 24 volt power will not be supplied to the I/O circuit unless shorted as in 3. An alarm is issued (06:24V POWER OFF) when power is not supplied and the operation disabled.

Please refer to "I/O Interface" in the controller instruction manual for detailed information on parallel I/O operation.



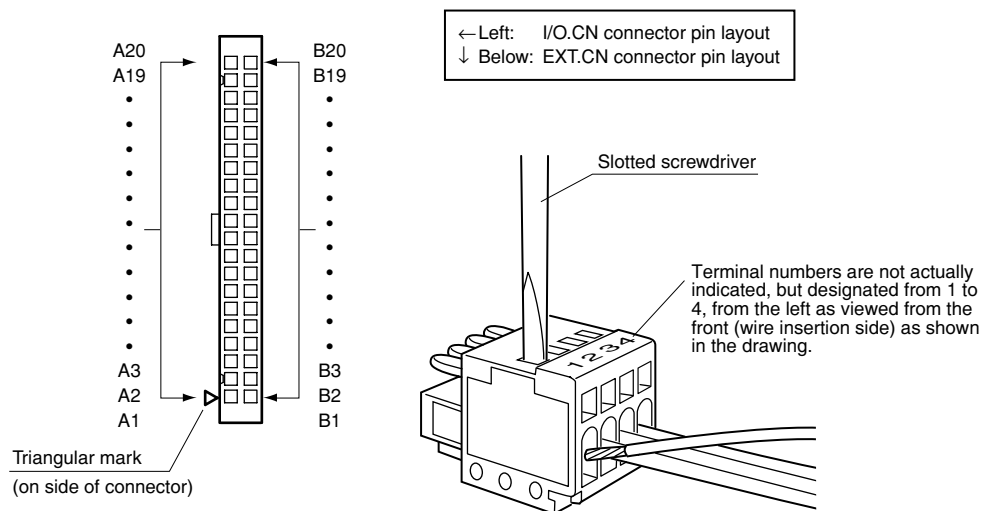
The register in the DeviceNet unit has an emergency stop input however this is just for control by the software and is not by itself totally adequate. So installing an interlock circuit for emergency stop using the above mentioned A-24 (EMG1) and B-24 (EMG2) is recommended.

■ When the SRCP/SRCD series is used:

1. Short Pin No. 1 (EMG 1) and Pin No. 2 (EMG 2) of the EXT.CN connector.
2. Short Pin No. B-4 (LOCK) of the I/O.CN connector and Pin No. 4 (24G) of the EXT.CN connector.
(This wiring can be eliminated by disabling bit 6 (Interlock function setting) of PRM34 (System mode selection).)
3. Connect Pin No. 3 (24V) and Pin No. 4 (24G) of the EXT.CN connector to an external 24 volt supply.

If Step 1 is not completed, an emergency stop will occur. If Step 2 is not completed, an interlock will be activated. The robot cannot move in either case. Also note that 24 volt power will not be supplied to the I/O circuit unless connected as in Step 3. An alarm is issued (06:24V POWER OFF) and the operation is disabled.

Refer to "I/O Interface" in the controller user's manual for detailed information on parallel I/O operation.



The register in the DeviceNet unit has an emergency stop input. However, this is just for control by the software and is not by itself totally adequate. So installing an interlock circuit for emergency stop using the above mentioned Pin No.1 (EMG1) and Pin No. 2 (EMG2) of the EXT.CN connector is strongly recommended.

2-5 Controller system settings (Slave station)

The MAC ID and the communication speed must be set so that the controller can be correctly identified as a slave station on the DeviceNet system.

The MAC ID settings and communication speed settings are made with DIP switches on the board.

These settings are enabled after the controller is restarted.

2-5-1 Validating the DeviceNet unit

Before the DeviceNet unit can be used, it must first be set as follows, to allow it to be identified by the controller.

- 1) Press **[F3]** (SYS) on the initial screen.

```
[MENU]
select menu

1EDIT 2OPRT 3SYS 4MON
```

- 2) Press **[F4]** (next) to switch the function display and then press **[F2]** (OPT).

```
[SYS]
select menu

1SAFE 2OPT 3UTL 4next
```

- 3) Press **[F1]** (DEV).

```
[SYS-OPT]
select menu

1DEV 2NODE 3SPD 4next
```

- 4) The current DeviceNet unit identity status appears on the display.
Now, using the number key pad, enter a 1 to make the DeviceNet unit identifiable from the controller or enter a 0 to prevent it being identified from the controller, and then press the **➡** key.

```
[SYS-OPT-DEV]
DeviceNet= 0
0:invalid 1:valid
```

- 5) When entry is finished, the screen returns to 4).

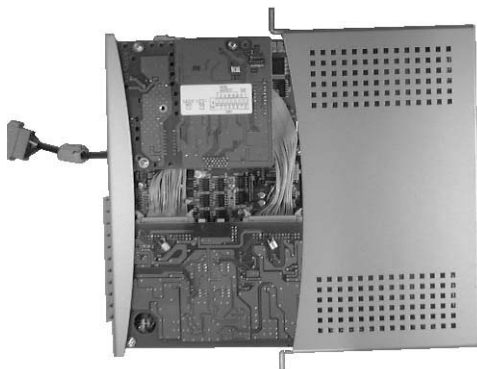
```
[SYS-OPT-DEV]
DeviceNet= 1
0:invalid 1:valid
```

2-5-2 Setting MAC ID and communication speed

⚠ CAUTION

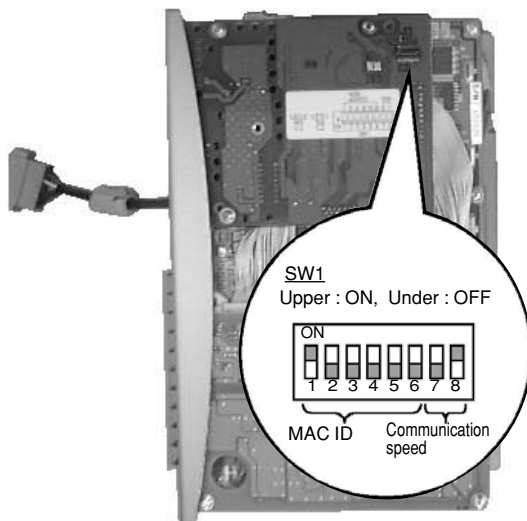
Always be sure to turn off power to the controller before attempting to make these settings to prevent possible electrical shock. When making the settings, also be sure not to touch any parts other than the DIP switch.

- 1) First, detach all connectors from the controller, and then remove the screws securing the controller unit and top cover (1 on top, 1 on the bottom, and 2 on the back (1 on the ERCX and SRCP/SRCD series controllers)). Then remove the top cover from the controller unit.



Remove top cover from controller unit.

- 2) Make the MAC ID and communication speed settings by changing the DIP switch settings on the DeviceNet board. Communication speeds 500K, 250K, 125K (in bps units) can be set with MAC ID #0 through #63 (see below). The communication speed must be set to match that of the master station. Use switches No. 1 - 6 for the MAC ID settings. Use switches No. 7 and 8 for setting the communication speed.



(MAC ID Settings)

MAC ID	Switch No.					
	6	5	4	3	2	1
#0	OFF	OFF	OFF	OFF	OFF	OFF
#1	OFF	OFF	OFF	OFF	OFF	ON
#2	OFF	OFF	OFF	OFF	ON	OFF
#3	OFF	OFF	OFF	OFF	ON	ON
:	:	:	:	:	:	:
#62	ON	ON	ON	ON	ON	OFF
#63	ON	ON	ON	ON	ON	ON

☆

(Communication Speed Settings)

Communication speed	Switch No.	
	8	7
125Kbps	OFF	OFF
250Kbps	OFF	ON
500Kbps	ON	OFF
Prohibited	ON	ON

☆

☆ :Default setting

⚠ CAUTION

Move the switches so they are definitely at either the ON or OFF side. If the DIP switches are in a neutral position, the controller might not operate normally. Do not use a lot of force when moving the switches. The switches will deteriorate under excessive force.

- 3) When finished making the settings, reinstall the cover and restore parts and cables back to their original positions.

2-5-3 How to check MAC ID and communication speed

MAC ID and communication speed settings made with a DIP switch on the board can be checked on the HPB. When the DIP switch settings are changed, always check that the new settings are correct.

- 1) Press **F3** (SYS) on the initial screen.

```
[MENU]
select menu

1EDIT2OPRT3SYS 4MON
```

- 2) Press **F4** (next) to switch the function display and then press **F2** (OPT).

```
[SYS]
select menu

1SAFE2OPT 3UTL 4next
```

- 3) Press **F2** (NODE) to display the MAC ID.

```
[SYS-OPT]
select menu

1DEV 2NODE3SPD 4next
```

- 4) The currently set MAC ID is displayed.

```
[SYS-OPT-NODE]
MAC ID = 30
```

- 5) Press the **ESC** key to return to the screen of 3).

Likewise, press **F3** (SPD) to display the communication speed.

```
[SYS-OPT]
select menu

1DEV 2NODE3SPD 4next
```

- 6) The currently set communication speed is displayed.

Press the **ESC** key to return to the previous screen.

```
[SYS-OPT-SPD]
speed = 500K [bps]
```

2-6 Sequencer (master station) settings

The master station sequencer (or PLC) in the DeviceNet system can make line tests on the remote station. Use this function to check whether or not the controller is identified as a slave station on the DeviceNet system before starting any actual work. Refer to the instruction manual for the master station sequencer (PLC) for detailed information.

////////////////////////////////////

To ensure that data is exchanged correctly and safely between the master station PLC and controller, create a PLC program for the master station that takes the following points into account.

- Put network status information into the PLC program as input conditions to help it handle problems in the network itself. (See the master PLC instruction manual for ways to enter status information.)
- When a network error is detected on the controller, the controller stops operating and turns the servo off. Also all I/O input from the DeviceNet are recognized as being off during the error. The I/O inputs are automatically restored as the network recovers from the error but the servo remains turned off. So to restore operation, emergency stop must be canceled and the servo restore command (SERVO) must be run.
- The controller always keeps the servo off right after its power is turned on. To operate the robot, cancel emergency stop and run the servo restore command (SERVO).
- The robot is resetting (initializing) itself immediately after the controller power is turned on, so do not perform communications right away. The END output turns on when the controller starts up normally and communication is allowed, so first check that the END output is on before inputting commands to the controller. (See "2-8-1 Right after controller power turns on".)

2-7 I/O information

On/off (I/O) information handled by the DeviceNet unit consists of 16 custom inputs, 16 general-purpose I/O inputs, 16 custom outputs and 16 general-purpose outputs. Functions assigned to custom inputs are sub-grouped into 13 dedicated command inputs, interlock, Service mode and emergency stop input.

* Some ports are currently reserved for future use and not available for dedicated command input and custom outputs.

DeviceNet I/O functions and methods for using them are basically identical to those for the parallel I/O that are a standard feature in the controller.

2-7-1 Profile (I/O signal table)

The following table is a list profiling the DeviceNet unit.

More detailed information on each signal is listed in "2-7-2 Dedicated command inputs".

Remote I/O signals

OUTPUT (Remote→Master)			INPUT (Master→Remote)		
Channel No.	Signal Name		Channel No.	Signal Name	
n	bit0	Servo status (SRV-O)	m	bit0	SERVO (servo recovery)
	bit1	(ZONE 0)		bit1	INC-PT (move relative point)
	bit2	(ZONE 1)		bit2	ABS-PT (move absolute point)
	bit3	(ZONE 2)		bit3	STEP-R (step operation)
	bit4	(ZONE 3)		bit4	AUTO-R (auto operation)
	bit5	Reserved		bit5	RESET
	bit6	Origin return status (ORG-O)		bit6	ORG-S (origin return)
	bit7	Reserved		bit7	LOCK (interlock)
	bit8	Reserved		bit8	Reserved
	bit9	Reserved		bit9	Reserved
	bit10	Reserved		bit10	Reserved
	bit11	Reserved		bit11	Reserved
	bit12	Reserved		bit12	Reserved
	bit13	END		bit13	Reserved
	bit14	BUSY (executing command)		bit14	SVCE (service mode)
	bit15	READY		bit15	EMG (emergency stop input)
n+1	bit0	SO200	m+1	bit0	SI200
	bit1	SO201		bit1	SI201
	bit2	SO202		bit2	SI202
	bit3	SO203		bit3	SI203
	bit4	SO204		bit4	SI204
	bit5	SO205		bit5	SI205
	bit6	SO206		bit6	SI206
	bit7	SO207		bit7	SI207
	bit8	SO208		bit8	SI208
	bit9	SO209		bit9	SI209
	bit10	SO210		bit10	SI210
	bit11	SO211		bit11	SI211
	bit12	SO212		bit12	SI212
	bit13	SO213		bit13	SI213
	bit14	SO214		bit14	SI214
	bit15	SO215		bit15	SI215

n, m: Values determined by channel settings.

⚠ CAUTION

- The above profile is for cases where the I/O assignment selection parameter is set to "Type 0: Conventional type" when the controller has an I/O assignment function. For information on the profile when the I/O assignment selection parameter is set to another type, refer to "2-9-2 I/O assignment list".
 - The zone output is supported by the following controller versions:
 ERCX, SRCX : Ver. 13.50 or later DRCX : Ver. 18.50 or later
 SRCP, SRCD : Ver. 24.00 or later SRCP30 : Ver. 24.30H or later
-

2-7-2 Dedicated command inputs

Dedicated command inputs are inputs from the sequencer (PLC) to the controller for performing specific processing such as origin return or servo recovery. To accept these inputs, the READY, BUSY, and Lock signals must be set as follows:

- READY : ON
- BUSY : OFF
- LOCK : ON

If the above conditions are not satisfied, then dedicated command inputs cannot be accepted. For example, when the BUSY signal is on, this means that the controller is already executing a dedicated command, so other dedicated commands are ignored if they are input. When the LOCK signal is off, no other commands can be accepted since interlock was triggered.

(As an exception, the reset command is executed if only the BUSY output conditions are met. The servo recovery command is executed if the BUSY conditions are met and all emergency stop inputs to the emergency stop circuit are cancelled.)

A dedicated command input is accepted when the dedicated command input is switched from OFF to ON (at the instant the contact point closes). Whether the controller accepts the command or not can be checked by monitoring the BUSY signal.

Note that dedicated command inputs cannot be used as data in a program.

⚠ CAUTION

The dedicated command inputs explained below must always be pulse inputs. In other words, they must be turned off (contact open) when the BUSY signal turns on.

If a dedicated command input is not turned off, then the BUSY signal will not turn OFF even when the command has ended normally. This means that the next command cannot be accepted.

■ Point movement command with absolute (ABS-PT)

When origin point coordinates are set at 0, this command moves the robot to a position specified in data by point No. (See "2-7-3 General-purpose inputs") specified by SI200 through SI209, and at a speed specified by SI210 and SI211. On dual-axis controllers, the axis to be moved can be specified with SI213, SI214 by making PRM10 valid.

⚠ CAUTION

When executing this command (ABS-PT), the status of SI200 and SI211 must be checked in advance. SI213 and SI214 must also be checked when specifying the axis.

■ Point movement command with incremental (INC-PT)

This command moves the robot from the current position to a position specified in data for point No. specified by SI200 through SI209, and at a speed specified by SI210 and SI211. On dual-axis controllers, the movement axis can be specified with SI213, SI214 by enabling PRM10.

MEMO

Current position is not necessarily the actual position of robot. It is the data of the current position that is saved internally in the controller. On each execution of a movement command, the point that was the target position changes to the current position. Therefore, even if interlock is triggered during execution of the relative movement command, the operation restarts from the point where the robot is stopped, by executing the same relative movement command again. (This does not constitute a relative movement based on the interlock-stopped point.)

Likewise, when the robot is moved manually to another position after executing the robot movement command, the relative movement command which is subsequently executed does not make a relative movement from the actual position of the robot. Instead, the robot makes a relative movement based on the target position of the previous robot movement command. Please bear this movement in mind.

The current position and robot position differ when:

- When emergency stop or interlock (LOCK) is applied during axis movement;
- A communication command "^C" (movement interruption) is sent during axis movement;
- The SERVICE mode input is changed during axis movement;
- The axis is moved manually; and
- The axis is move manually in the servo off state (including emergency stop state).

⚠ CAUTION

SI200 to SI211 status must be checked in advance when running INC-PT. SI213 and SI214 must also be checked when specifying the axis.

■ Automatic run start command (AUTO-R)

The program is run continuously, starting from the current step.
All tasks are executed when the multi-task program is running.

■ Step run start command (STEP-R)

The program is run step by step, starting from the current step.
The multi-task program only executes the selected task.

■ Origin return command (ORG-S)

This command performs origin return when the search method was selected as the origin detection method, or checks the origin return status if the mark method was selected.

On dual-axis controllers, you can specify the axis for origin return with SI213, SI214 by making PRM10 valid.

MEMO

When performing origin return on a search method axis, if both a mark method axis and a search method axis are present, then origin return must first be completed on the mark method. Mark method origin return is performed on the HPB.

MEMO

Once origin return is performed after the absolute battery and robot cable are connected, it does not have to be performed again, even if the power is turned off. (Exceptions to this are if the absolute battery backup was disabled or origin-point related parameters were changed. Origin point is then incomplete (pending) and must be re-performed.

⚠ CAUTION

Do not halt on-going origin return during origin point detection (while contacting the mechanical limits) when using the stroke end origin detection method. A controller overload will trigger an alarm stop condition and the power must be turned off and then on again.

⚠ CAUTION

When repeating origin return by the stroke end detection method is unavoidable, wait at least 5 seconds before trying it again.

■ Servo ON command (SERVO)

After an emergency stop, cancel it by releasing the emergency stop switch. This triggers an input to turn the servo power on, and the robot can then resume operation. (The SERVO command is also a pulse input, so must be turned OFF when BUSY turns ON.)

On dual-axis controllers, the servo recovery axis can be specified with S1213, S1214 by making PRM10 valid.

■ Reset command (RESET)

This command returns the program step to the first step of the lead program, and turns DO0 - DO12^{*1}, SO200 - SO231, and the memory I/O all off. The point variable "P" is also cleared to 0. (Does not clear the counter variables "C" and "D".

* The output from a parallel I/O port used for emulated serialization does not change even if reset with the RESET command.

* When the "origin return completed action selection" parameter (single-axis controllers: PRM33, dual-axis controllers: PRM2) is 1 or 3, DO4^{*2} does not turn OFF even if reset with the RESET command. In the same way, if the "servo status output selection" parameter (single-axis controllers: PRM46, dual-axis controllers: PRM21) is 1, DO7^{*3} does not turn OFF even if reset with the RESET command.

MEMO

The lead program is a program selected by switching to the last program run by HPB or POPCOM.

The lead program can also be switched by running the "@SWI" communication command. It can also be switched even when program data is loaded from the memory card.

*1: DO0 to DO4 when the SRCP/SRCD series controllers are used.

*2: DO5 when the DRCX series controllers are used.

*3: DO3 when the SRCP/SRCD series controllers are used.

2-7-3 General-purpose inputs (SI200 - SI215)

General-purpose inputs are inputs freely available to the user for handling as data in the program.

As a special usage method, SI200 - SI209 can specify point numbers, and SI210 - SI211 can specify movement speed during running of ABS-PT or INC-PT point movement commands. As shown in the table below, a binary code should be entered in SI200 - SI209 to specify the point numbers P0 - P999.

The movement speed is 100% when SI210 and SI211 are both OFF. At all other times, the movement speed is specified by parameters.

By making parameter settings, SI213 and SI214 are sometimes used to specify the movement axis.

Specifying a point number

SI No. Point No.	SI209 (2 ⁹)	SI208 (2 ⁸)	SI207 (2 ⁷)	SI206 (2 ⁶)	SI205 (2 ⁵)	SI204 (2 ⁴)	SI203 (2 ³)	SI202 (2 ²)	SI201 (2 ¹)	SI200 (2 ⁰)
P0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
P1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
P3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
P7	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
P15	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
P31	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
P63	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
P127	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
P254	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF
P511	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON
P999	ON	ON	ON	ON	ON	OFF	OFF	ON	ON	ON

Specifying movement speed

SI211	SI210	Movement speed
OFF	OFF	100%
OFF	ON	PRM5*
ON	OFF	PRM6*
ON	ON	PRM7*

Specifying the movement axis (For dual-axis controllers)

SI214	SI213	Movement axis
OFF	OFF	All axes
OFF	ON	X axis
ON	OFF	Y axis
ON	ON	All axes

* For dual-axis controllers. For single-axis controllers, the speed is set in order from the top, by PRM41, PRM42, PRM43.

MEMO

The above tables are for cases where the I/O assignment selection parameter is set to "Type 0: Conventional type" when the controller has an I/O assignment function. For examples of specifying each item when the I/O assignment selection parameter is set to another type, refer to "2-9-4 I/O signal description".

2-7-4 Interlock (LOCK)

These are inputs to temporarily stop robot movement.

Robot operation can be stopped by setting this input to OFF during running of dedicated commands from the I/O, during running of a program by HPB (or personal computer), or during return to origin. (Of course, the program operation also stops.)

When this input is OFF however, dedicated commands from the I/O and running of programs from the HPB (or personal computer) as well as origin return are all disabled. Therefore you should normally keep this input at ON.

The only exceptions to this, are the RESET and SERVO commands whose inputs are enabled regardless of whether this interlock input is ON or OFF.

Once the interlock is set to OFF, the robot remains stopped until another command is input (AUTO-R, ORG-S) even if the interlock is set to ON again.

MEMO

Interlocks inputs on the parallel I/O of the controller are always operational. So if either of the 2 interlock inputs is off, the interlock is triggered and automatic operation is disabled. Both interlock inputs must be on in order to run in automatic operation. (On the SRCP/SRCD series, the parallel I/O interlock can be disabled by the parameter setting. For more details, refer to "2-4 Parallel I/O connector".)

2-7-5 Emergency stop input (EMG)

Use this EMG input when you want to set the robot to emergency stop. Setting this input to OFF cuts off the servo power and turns off the servo.

To restart operation, first set this input to ON, then input the servo recovery command (SERVO) after checking that the READY output is ON. The servo turns ON and the robot can now be operated.

When the HPB (or personal computer) is connected, you can reset from emergency stop by the HPB (or personal computer) operation.

The emergency stop input in the DeviceNet unit is only controlled by the software and does not constitute a complete safety circuit. So installing a hardware interlock circuit for emergency stop utilizing the emergency stop input pins installed on the parallel I/O of the controller is strongly recommended.

2-7-6 Service mode (SVCE)

This input is enabled only when the controller unit has itself been set to service mode. The SVCE (service) mode input is for notifying the controller of whether or not it is in service mode. Set this input to off (contacts open) when in service mode.

MEMO

Operation stops if the service mode input changes during robot operation.

MEMO

When the service mode function is enabled, the DI15* on the parallel I/O also functions as a service mode input. So the service mode is set, if either of these 2 service mode inputs turns off. Both of these service mode inputs must be turned on in order to exit the service mode.

* DI7 when the SRCP/SRCD series controllers are used.

2-7-7 Custom outputs

Custom outputs inform the sequencer (PLC) of controller status.

■ "Preparation completed" output (READY)

The custom output is ON while the controller system is operating normally. However the output turns OFF under any of the following conditions and the motor becomes "free".

- During emergency stop

The READY output turns ON again when emergency stop is canceled. After canceling emergency stop, operation can be restarted by inputting the servo recovery command (SERVO).

- During alarm

If the READY signal is OFF but the robot is not in emergency stop, then some kind of alarm was issued. In this case, operation cannot resume unless the power is turned off and then on again.

■ "Command execution in progress" output (BUSY)

The BUSY signal is ON during execution of a dedicated command input, or execution of a command from the HPB (or personal computer). This signal turns ON when the custom input signal is received, so turn custom input signal OFF when the BUSY signal turns ON. The BUSY output turns OFF when the executing of this command is ended. (However, all the custom inputs must be OFF at this time.)

CAUTION

Always input the dedicated command input as a pulse signal. If this input stays ON, the BUSY signal cannot be turned OFF even if finished executing the command.

If the BUSY output is at ON, then the controller cannot accept custom inputs and commands from the HPB (or personal computer). Do not try to operate the HPB while the I/O interface is controlling the controller.

(This could cause communication errors with the sequencer (PLC) or cause communication error to occur in the HPB.

■ "Execution ended" output (END)

This signal turns OFF when a dedicated command input is received, and then turns ON when the command ends normally. When an error occurs during execution of a command or when an interlock or emergency stop has triggered, the END signal remains unchanged at OFF.

CAUTION

When the RESET command or a movement command for only a small movement is run, the time for running the command (in other words the interval that the END signal is OFF) is extremely short. (Sometimes less than 1ms.)

The END signal will not change during operation from the HPB (or personal computer).

MEMO

By changing the System mode selection parameter setting (single-axis controllers: PRM34, dual-axis controllers: PRM20), the execution result of a dedicated command can be output to the END signal at the time when the dedicated command input has turned OFF after the command execution.

For details on the System mode selection parameter, refer to "Description of each parameter" in the controller user's manual.

■ "Servo status" output (SRV-O)

Displays the robot servo status.

This turns ON when all axes are at servo-ON. However, this output is OFF if even just one axis is in servo-OFF status.

* This servo status output is always enabled, even if the "servo status output selection" parameter (single-axis controllers: PRM46, dual-axis controllers: PRM21) does not have to be changed.

■ "Origin return status" output (ORG-O)

This outputs the robot origin return status.

This output is ON when origin return is complete on all axes. This output however turns OFF if even origin return on even just one axis is incomplete.

* This output is always enabled, even if the "origin return completed action selection" parameter (single-axis controllers: PRM33, dual-axis controllers: PRM2) does not have to be changed.

■ Zone output (ZONE0 to ZONE3)

This specifies the output destination of the zone output function.

The zone output is used to control the signal output when the robot's current position is within the specified range.

To use the zone output function, the desired zone output must be enabled by the Zone output selection parameter (single-axis controllers: PRM53, dual-axis controllers: PRM24). This parameter also sets the zone output logic.

Use point data to specify the range. Point numbers and output signal names used for each zone are shown below.

For details on the zone output, refer to the "Zone output selection" parameter described in the controller user's manual.

Setting range and output port for each zone

ZONE No.	Specified range	Output signal name
ZONE 0	P900-P901	ZONE 0
ZONE 1	P902-P903	ZONE 1
ZONE 2	P904-P905	ZONE 2
ZONE 3	P906-P907	ZONE 3

MEMO

The zone output is supported by the following controller versions:

ERCX, SRCX : Ver. 13.50 or later DRCX : Ver. 18.50 or later
 SRCP, SRCD : Ver. 24.00 or later SRCP30 : Ver. 24.30H or later

2-7-8 General-purpose outputs (SO200 - SO215)

These are outputs available to the user and can be freely turned on and off within the program. All general-purpose outputs are reset (OFF) when the power is turned on or when the program is reset.

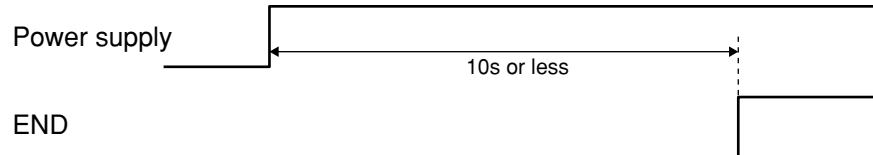
* A parallel I/O port used for emulated serialization cannot be controlled while a program is running. Also, the output from a parallel I/O port used for emulated serialization does not change even if reset with the RESET command.

2-8 Timing chart

Typical timing charts are shown below, so refer to them when creating the PLC program.

2-8-1 Right after controller power turns on

Normal startup



When alarm has occurred



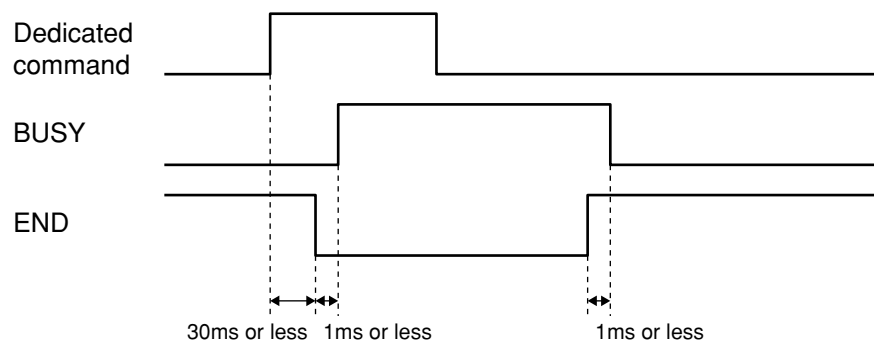
- After power is turned on, the END output turns on when the controller has started up normally and communication is allowed. So first check that the END output is on before inputting commands.
- The robot always sets to servo-off when the controller power is turned on. To operate the robot, cancel emergency stop by referring to "2-8-2 Custom input command execution" and then run the SERVO (servo recovery) command.
- When the END output is off even after the specified amount has elapsed after power-on, this means that communication is impossible due to a network error or that an alarm was issued on the controller. To troubleshoot an alarm that occurred on the controller, refer to "Alarm and Countermeasures" in the controller instruction manual.

2-8-2 Custom input command execution

- The BUSY output turns ON when a dedicated command input is received. Whether or not the received command ended normally is checked by the END output at the point when the BUSY output turns OFF. In other words, the END output that is ON at this time, shows the command ended normally. However the command did not end normally if the END output is OFF.
- Always input the dedicated command input as a pulse signal. If this input stays on, the BUSY signal cannot turn OFF even if the command is complete.

(1) When a long execution time command runs and ends normally:

(The command execution is in progress and the END signal off when the dedicated command input turns off (contact open))



- (1) At the rise of the dedicated command input, the END signal turns off and the BUSY signal turns on.
- (2) Turns off (contact open) the dedicated command input after the BUSY signal turns on.
- (3) Wait until the BUSY signal turns off.
- (4) The END signal should be on when the BUSY signal turns off, indicating that the command has ended normally.

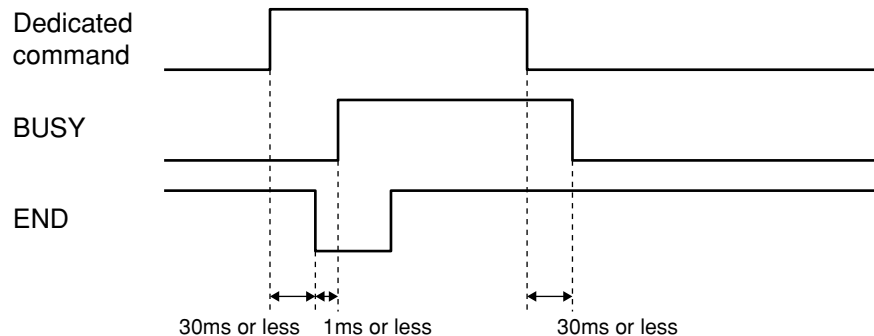
CAUTION

With the auto run (AUTO-R) command, the END signal turns on and the BUSY signal turns off when the program has ended or a STOP statement was executed. When an endless program (one that always automatically returns to the top line of the program from the last step) was run, the BUSY signal does not turn off unless an interlock or emergency stop is triggered.

(2) When a short execution time command runs and ends normally

(In the following cases, when the dedicated command input is turned OFF (contact opens), the command has already ended, and END has turned ON.)

- When running a movement command (ABS-PT, INC-PT) with an extremely short movement distance.
- When RESET was run.
- When running steps of a command having an extremely short processing time such as L or DO statements.



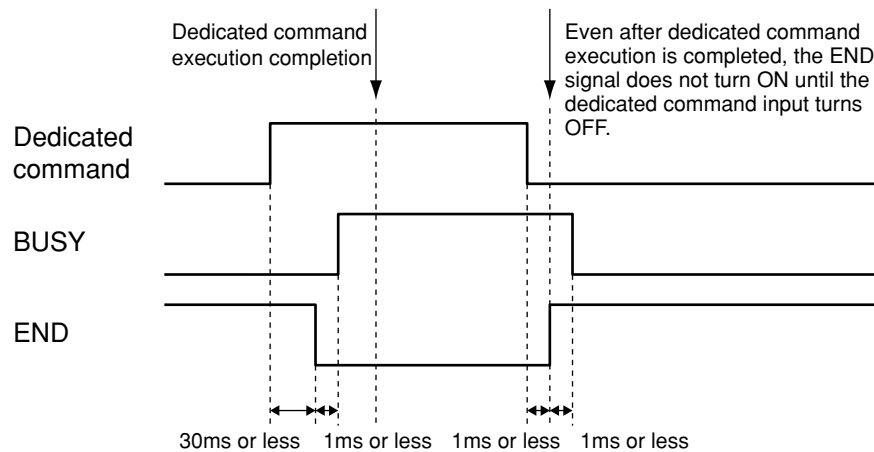
- (1) At the rise of the dedicated command input, the END signal turns off and the BUSY signal turns on.
- (2) Turns off (contact open) the dedicated command input after the BUSY signal turns on.
- (3) Wait until the BUSY signal turns off. (The BUSY signal immediately turns off since the command execution time is short.)
- (4) The END signal should be on when the BUSY signal turns off, indicating that the command has ended normally.

The "bit 7 END output sequence setting at command execution completion" in the System mode selection parameter (single-axis controllers: PRM34, dual-axis controllers: PRM20) can be changed so that the END signal turns ON when the dedicated command input turns OFF.

MEMO

The "bit 7 END output sequence setting at command execution completion" in the System mode selection parameter (single-axis controllers: PRM34, dual-axis controllers: PRM20) is supported by the following controller versions:

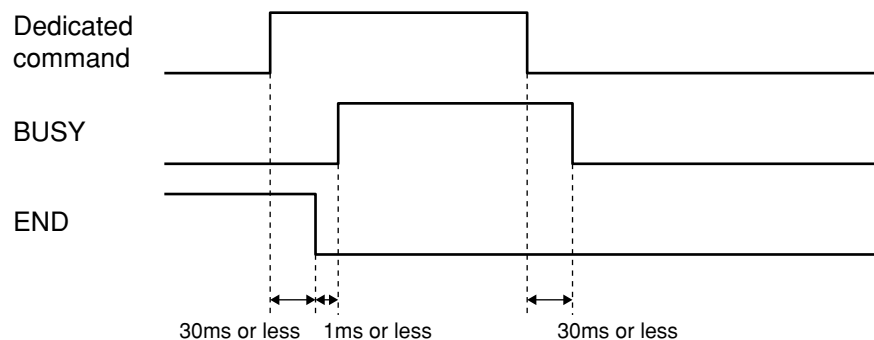
ERCX, SRCX : Ver. 13.74 or later	DRCX : Ver. 18.74 or later
SRCP, SRCD : Ver. 24.32 or later	SRCP30 : Ver. 24.32H or later



(3) When running a command was impossible from the start

(In the following cases, END will not turn ON, when running of command was impossible from the start.)

- When a movement command (ABS-PT, INC-PT) was run without first completing return to origin.
- When an operation start command (AUTO-R, STEP-R) was run without first completing return to origin (except when pre-operation selection parameter (single-axis controllers : PRM48, dual-axis controllers : PRM9) was set to 1 or 3).
- When an unregistered point No. was specified, and a movement command (ABS-PT, INC-PT) was run.
- When a dedicated command was run while in emergency stop or an interlock triggered. (except for RESET and SERVO commands)

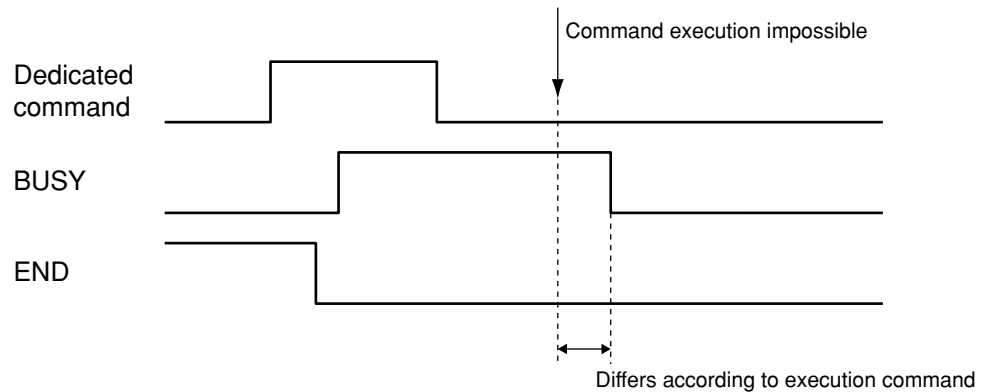


- (1) At the rise of the dedicated command input, the END signal turns off and the BUSY signal turns on.
- (2) Turns off (contact open) the custom dedicated input after the BUSY signal turns on.
- (3) Wait until the BUSY signal turns off. (The BUSY signal immediately turns off since the command cannot be executed.)
- (4) The END signal remains off when the BUSY signal turns off, indicating that the command could not end normally.

(4) When an on-going command becomes impossible to run

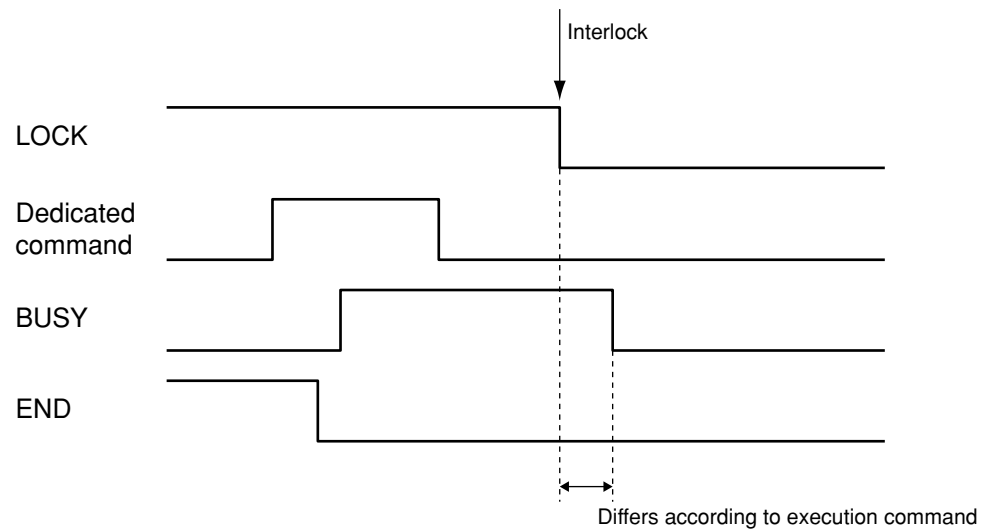
(In the following cases, END will not turn ON, when running of an on-going command becomes impossible.)

- When an interlock or emergency stop was triggered during running of a dedicated command.
- When a jump to an unregistered program was made during automatic operation, a move to an unregistered point was made or some kind of error occurred.



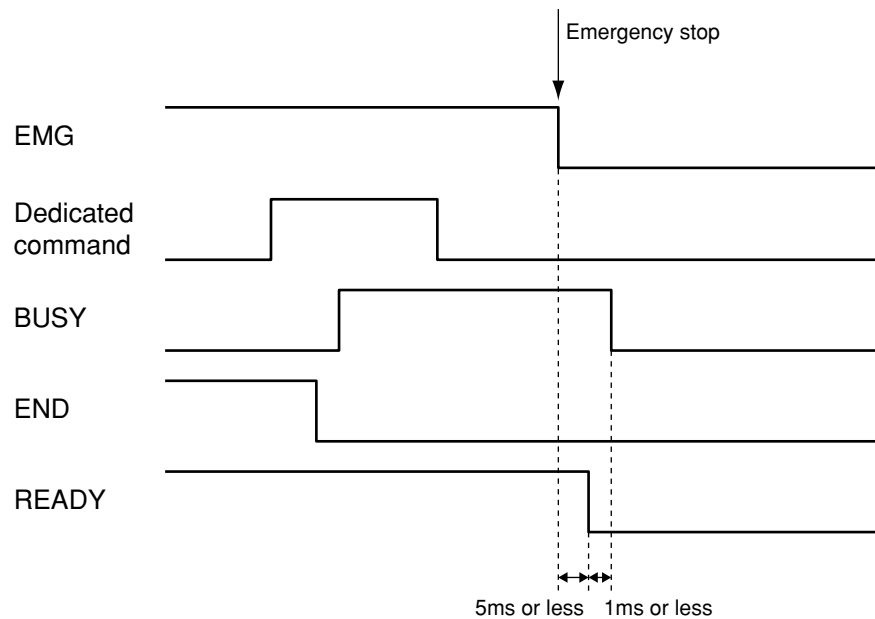
- (1) At the rise of the dedicated command input, the END signal turns off and the BUSY signal turns on.
- (2) Turns off (contact open) the dedicated command input after the BUSY signal turns on.
- (3) Wait until the BUSY signal turns off.
- (4) The BUSY signal turns off because the command execution becomes impossible before it is fully executed.
- (5) The END signal remains off when the BUSY signal turns off, indicating that the command could not end normally.

2-8-3 When interlock signal is input



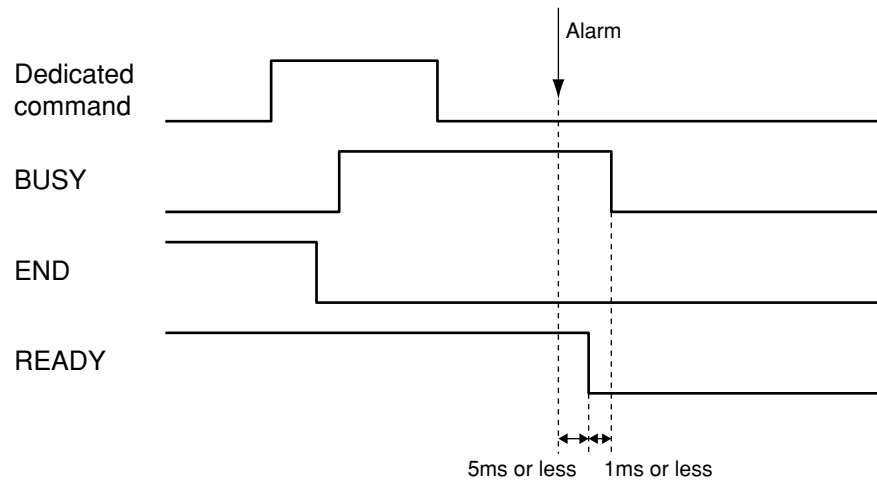
- The BUSY output turns OFF when an interlock signal is input during running of a dedicated command. The READY output and the END output remain unchanged.

2-8-4 When emergency stop signal is input



- The READY output turns OFF. The BUSY output turns OFF during running of a dedicated command. The END output is unchanged.
- To resume robot operation, after canceling emergency stop and checking that the READY output is ON, input the SERVO command.

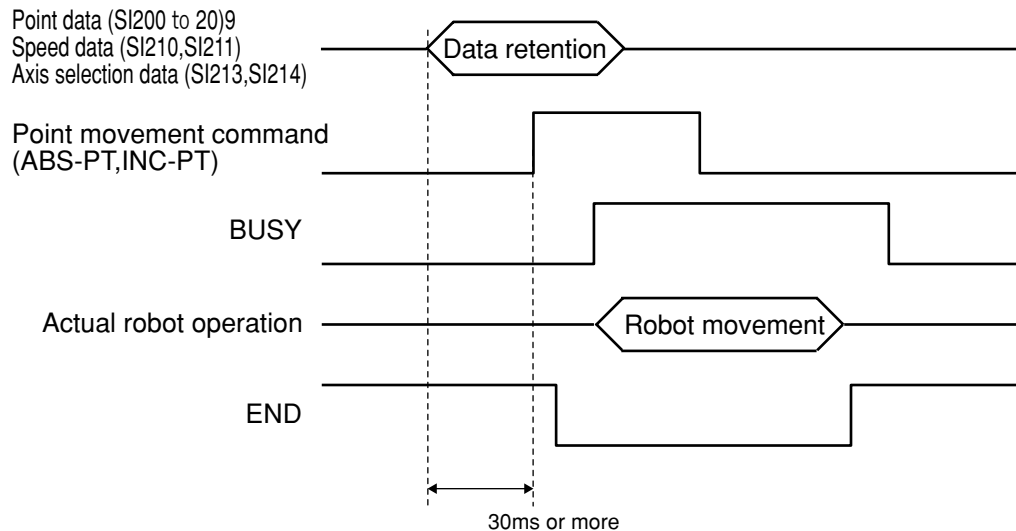
2-8-5 When an alarm is issued



- The READY, BUSY and END outputs all turn off.
- To troubleshoot an alarm that occurred on the controller, refer to "Alarm and Countermeasures" in the controller instruction manual.

2-8-6 When point movement commands are run

- When executing a point movement command (ABS-PT, INC-PT), the point data and speed data must be input before inputting the dedicated command. When specifying the moving axis, the axis selection data must be input. The point data and speed data inputs are designated with SI200 to SI211. The axis selection data input is designated with SI213 to SI214. (Refer to "2-7-3 General-purpose input (SI200 to SI215)".)



- (1) Input the point and speed data into SI200 - SI211. To specify a movement axis, input the axis (designation) data into SI213, SI214. Please hold this data until the BUSY signal turns on. (Changing data while busy may sometimes cause data recognition errors.)
- (2) Input the point movement commands (ABS-PT, INC-PT) after delaying the time to 30 ms or more.
- (3) The END signal turns off at the rise of the custom input pulse, and the BUSY signal turns on.
- (4) After checking that the BUSY is on, the custom input command is set to off (contact opens). From hereon, point data, speed data (SI200 - SI211), and the axis (designation) data (SI213 and SI214) may be changed as needed.
- (5) Waits until the BUSY signal turns off.
- (6) When the BUSY signal has turned off, the END signal is at ON, indicating that the command ended normally.

2-9 I/O assignment change function

2-9-1 Changing the I/O assignment

The I/O assignment change function changes the function assigned to each input/output (I/O) signal.

I/O assignment can be changed by setting the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controller: PRM26). For the contents of I/O assignment, refer to "2-9-2 I/O assignment list". Also refer to "2-9-3 I/O assignment selection parameter description" for details on the I/O assignment selection parameter and "2-9-4 Input/output signal description" for details on each input/output signal used for I/O assignment selection. After changing the I/O assignment, the controller must be restarted to enable the changes.

MEMO

The I/O assignment change function is supported by the following controller versions:

ERCX, SRCX	: Ver. 13.57 or later	DRCX	: Ver. 18.57 or later
SRCP, SRCD	: Ver. 24.17 or later	SRCP30	: Ver. 24.30H or later

2-9-2 I/O assignment list

The table below shows the function assigned to each input/output (I/O) signal by setting the I/O assignment selection parameter.

For details on the I/O assignment selection parameter, refer to "2-9-3 I/O assignment selection parameter description". For details on each I/O signal, refer to "2-9-4 I/O signal description".

I/O assignment list

Type			Type 0 (Conven- tional type)	Type 1	Type 2 (Point number output type)		Type 3 (Point teaching type)			
							Point trace mode	Teaching mode	Point trace mode	Teaching mode
I/O assignment selection parameter			0 (Standard)	—	xx20 *1	xx21 *1	xx30 *1		xx31 *1	
Function										
No. of points *2			1000	—	64	16	64		16	
No. of speed switching points *3			4	—	None	4	None		4	
Program operation by I/O			Yes	—	No	No	No		No	
Channel No.										
Input (Master → Remote)	m	bit0	SERVO	Cannot be used.	SERVO	SERVO	SERVO		SERVO	
		bit1	INC-PT		INC-PT	INC-PT	JOG-	INC-PT	JOG-	
		bit2	ABS-PT		ABS-PT	ABS-PT	JOG+	ABS-PT	JOG+	
		bit3	STEP-R				CHG		CHG	
		bit4	AUTO-R					PSET		PSET
		bit5	RESET		RESET	RESET	RESET		RESET	
		bit6	ORG-S		ORG-S	ORG-S	ORG-S		ORG-S	
		bit7	LOCK		LOCK	LOCK	LOCK		LOCK	
		bit8								
		bit9								
		bit10								
		bit11								
		bit12								
		bit13								
		bit14	SVCE		SVCE	SVCE	SVCE		SVCE	
		bit15	EMG		EMG	EMG	EMG		EMG	
	m+1	bit0	SI200		PI200	PI200	PI200		PI200	
		bit1	SI201		PI201	PI201	PI201		PI201	
		bit2	SI202		PI202	PI202	PI202		PI202	
		bit3	SI203		PI203	PI203	PI203		PI203	
		bit4	SI204		PI204	SPD201	PI204		SPD201	
		bit5	SI205		PI205	SPD202	PI205		SPD202	
		bit6	SI206							
		bit7	SI207							
		bit8	SI208							
		bit9	SI209							
		bit10	SI210							
		bit11	SI211							
		bit12	SI212							
		bit13	SI213 *4		*4	*4	*4		*4	
		bit14	SI214 *4		*4	*4	*4		*4	
		bit15	SI215							

(continued to next page)

Output (Remote → Master)	n	bit0	SRV-O	Cannot be used.	SRV-O	SRV-O	SRV-O	SRV-O
		bit1	(ZONE0)		(ZONE0)	(ZONE0)	(ZONE0)	(ZONE0)
		bit2	(ZONE1)		(ZONE1)	(ZONE1)	(ZONE1)	(ZONE1)
		bit3	(ZONE2)		(ZONE2)	(ZONE2)	(ZONE2)	(ZONE2)
		bit4	(ZONE3)		(ZONE3)	(ZONE3)	(ZONE3)	(ZONE3)
		bit5						
		bit6	ORG-O		ORG-O	ORG-O	ORG-O	ORG-O
		bit7						
		bit8						
		bit9						
		bit10						
		bit11						
		bit12						
		bit13	END		END	END	END	END
		bit14	BUSY		BUSY	BUSY	BUSY	BUSY
		bit15	READY		READY	READY	READY	READY
	n+1	bit0	SO200		PO200	PO200	PO200	PO200
		bit1	SO201		PO201	PO201	PO201	PO201
		bit2	SO202		PO202	PO202	PO202	PO202
		bit3	SO203		PO203	PO203	PO203	PO203
		bit4	SO204		PO204	ORG-O/ZONE0	PO204	ORG-O/ZONE0
		bit5	SO205		PO205	SRV-O/ZONE1	PO205	SRV-O/ZONE1
		bit6	SO206					
		to bit15	to SO215					

n, m : Values determined by channel setting

*1: The PO output format differs depending on the values in the "hundreds" and "thousands" places of the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26).

*2: Specifies the permissible number of movement points for a point movement command (ABS-PT, INC-PT).

*3: Specifies the permissible number of speed switching points for a point movement command (ABS-PT, INC-PT).

*4: In dual-axis controllers, a desired axis can be specified using SI213 and SI214 when executing I/O dedicated commands (ABS-PT, INC-PT, ORG-S, and SERVO). In this case, the PRM10 (control axis selection with I/O command) must first be set to "Valid". The same applies when specifying a control axis for executing JOG movement commands (JOG+, JOG-).

2-9-3 I/O assignment selection parameter description

The I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26) selects the function to be assigned to each I/O signal.

This parameter setting allows changing the function assigned to each I/O signal. This makes it possible to output the destination point number and perform jog movement.

After changing the I/O assignment, the controller must be restarted to enable the changes.

MEMO

The I/O assignment selection parameter is supported by the following controller versions:

ERCX, SRCX : Ver. 13.57 or later DRCX : Ver. 18.57 or later
SRCP, SRCD : Ver. 24.17 or later SRCP30 : Ver. 24.30H or later

I/O assignment selection parameter

Parameter number Single-axis controllers : PRM59
Dual-axis controllers : PRM26
Input range 0 or another number (Refer to "2-9-2 I/O assignment list".)
Meaning PRM59/PRM26 = $\frac{x}{\uparrow} \frac{x}{\uparrow} \frac{xx}{\uparrow}$

③ ② ①

① I/O assignment type selection

Value	Description
00	Type 0 (Conventional type/standard)
20	Type 2 (Point number output type)
21	
30	Type 3 (Point teaching type)
31	

MEMO

Type 1 cannot be used with the SRCP, SRCD, SRCX, SRCX, and DRCX.

② Point output selection

Make setting only for Type 2 (Point number output type) or Type 3 (Point teaching type).

Value	Description
0	Outputs PO when movement ends normally.
1	Outputs PO when movement command is received.
2	Point zone output Outputs PO when the robot enters the $\pm$ position judgment parameter range for point data registered in the controller.
3	Movement point zone output Outputs PO when the robot enters the $\pm$ position judgment parameter range for point data that is registered in the controller and serves as the movement target position of a point movement command (ABS-PT, INC-PT).

MEMO

The movement point zone output is supported by the following controller versions:

ERCX, SRCX : Ver. 13.64 or later DRCX : Ver. 18.64 or later
SRCP, SRCD : Ver. 24.21 or later SRCP30 : Ver. 24.30H or later

③ Point zone judgment method selection

The position judgment parameter is selected when the point output selection is "2" (point zone output) or "3" (movement point zone output).

Value	Description
0	OUT valid position
1	Positioning-completed pulse

MEMO

- The Point zone judgment method selection is supported by the following controller versions:
 ERCX, SRCX : Ver. 13.64 or later DRCX : Ver. 18.64 or later
 SRCP, SRCD : Ver. 24.21 or later SRCP30 : Ver. 24.30H or later
- In controller versions prior to the above versions, the "OUT valid position" is the only point zone judgment method.

Initial value 0

CAUTION

Any value other than the above is handled as a "0" (Type 0).

(Example) If set to 2331, this is handled as a "0" (Type 0).

If set to 10, this is handled as a "0" (Type 0).

Moreover, if Type 2 (Point number output type) or Type 3 (Point teaching type) is selected in controller versions not supporting the movement point zone output while the point output selection is specified as "3", this is also processed as a "0" (Type 0) setting.

(Example) In controller versions not supporting the movement point zone output:

If set to 331, this is handled as a "0" (Type 0).

2-9-4 I/O signal description

The meaning of each signal is explained below. For the meaning of signals not described here, refer to "2-7-2 Dedicated command input" and the following sections.

■ Point number designation inputs 200 to 205 (PI200 to PI205)

These inputs designate the point number of the target position where the robot moves with a point movement command (ABS-PT, INC-PT). (For details on the ABS-PT and INC-PT commands, see 2-7-2, "Dedicated command input" in this chapter.)

These inputs are also used to designate the point number of the target position where point data is written with a point data write command (PSET).

The point number of the target position must be specified before running a point movement command or point write command. The point number is specified by a binary code. See the table below to specify each point number.

Point number designation example

PI No. Point No.	PI205 (2 ⁵)	PI204 (2 ⁴)	PI203 (2 ³)	PI202 (2 ²)	PI201 (2 ¹)	PI200 (2 ⁰)
P0	OFF	OFF	OFF	OFF	OFF	OFF
P1	OFF	OFF	OFF	OFF	OFF	ON
P7	OFF	OFF	OFF	ON	ON	ON
P15	OFF	OFF	ON	ON	ON	ON
P31	OFF	ON	ON	ON	ON	ON
P63	ON	ON	ON	ON	ON	ON

■ Movement speed setting (SPD201, SPD202)

Designates the speed at which the robot moves with a point movement command (ABS-PT, INC-PT) or jog movement command (JOG+, JOG-). (For details on the ABS-PT and INC-PT commands, see 2-7-2, "Dedicated command input" in this chapter.)

The movement speed must be specified before running a point movement command or jog movement command. See the table below to specify the movement speed.

Movement speed setting example

SPD202	SPD201	Movement speed
OFF	OFF	100%
OFF	ON	I/O point movement command first speed (single-axis controllers: PRM41, dual-axis controllers: PRM5)
ON	OFF	I/O point movement command second speed (single-axis controllers: PRM42, dual-axis controllers: PRM6)
ON	ON	I/O point movement command third speed (single-axis controllers: PRM43, dual-axis controllers: PRM7)

■ Jog movement (+ direction) command (JOG+)

Moves the robot in jog mode along the + (plus) direction.

The robot moves in jog mode along the + (plus) direction as long as this signal is on. The movement speed is 100mm/sec.

This speed can be changed by using SPD201 and SPD202. In this case, the movement speed is given by the following equation.

$$\text{Movement speed [mm/sec]} = 100 \times (\text{Movement speed [\%] specified with SPD201 and SPD202}) / 100$$

In the case of dual-axis controllers, the X-axis is usually used for jog movement.

However, the Y-axis can be specified with SI213 and SI214 by enabling PRM10 (Control axis selection with I/O command). (Refer to "PRM10: Control axis selection with I/O command" in the DRCX controller user's manual.)

Axis selection example

SI214	SI213	JOG+, JOG- Selected axis
OFF	OFF	X-axis
OFF	ON	X-axis
ON	OFF	Y-axis
ON	ON	X-axis

⚠ CAUTION

- If the CHG (mode switch input) signal is switched during jog movement, the robot comes to an error stop.
- When selecting the axis of a dual-axis controller, the status of SI213 and SI214 must first be determined. (Refer to "Jog movement (JOG+, JOG-)" in "2-9-5 Timing chart".)

■ Jog movement (- direction) command (JOG-)

Moves the robot in jog mode along the - (minus) direction.

The robot moves in jog mode along the - (minus) direction as long as this signal is on. The movement speed is 100mm/sec.

This speed can be changed by using SPD201 and SPD202. In this case, the movement speed is given by the following equation.

$$\text{Movement speed [mm/sec]} = 100 \times (\text{Movement speed [\%] specified with SPD201 and SPD202}) / 100$$

In the case of dual-axis controllers, the X-axis is usually used for jog movement.

However, the Y-axis can be specified with SI213 and SI214 by enabling PRM10 (Control axis selection with I/O command). (Refer to "PRM10: Control axis selection with I/O command" in the DRCX controller user's manual.)

Axis selection example

SI214	SI213	JOG+, JOG- Selected axis
OFF	OFF	X-axis
OFF	ON	X-axis
ON	OFF	Y-axis
ON	ON	X-axis

⚠ CAUTION

- If the CHG (mode switch input) signal is switched during jog movement, the robot comes to an error stop.
- When selecting the axis of a dual-axis controller, the status of SI213 and SI214 must first be determined. (Refer to "Jog movement (JOG+, JOG-)" in "2-9-5 Timing chart".)

■ Mode switch input (CHG)

Switches the Type 3 (Point teaching type) mode. Selectable modes are as follows.

- (1) Point trace mode
- (2) Teaching mode

The Type 3 (Point teaching type) mode is switched to "Point trace mode" when the CHG signal is off, and is switched to "teaching mode" when the CHG signal is on.

⚠ CAUTION

If the CHG signal is switched during execution of a point movement command (ABS-PT, INC-PT) or jog movement command (JOG+, JOG-), the robot comes to an error stop.

■ Point data write command (PSET)

Writes the current position data in the specified point number.

To use this command, the point number for writing the current position data must first be specified using a PI (point number designation input) input.

The PSET is enabled only when return-to-origin has been completed.

■ Target position's point number outputs 200 to 205 (PO200 to PO205)

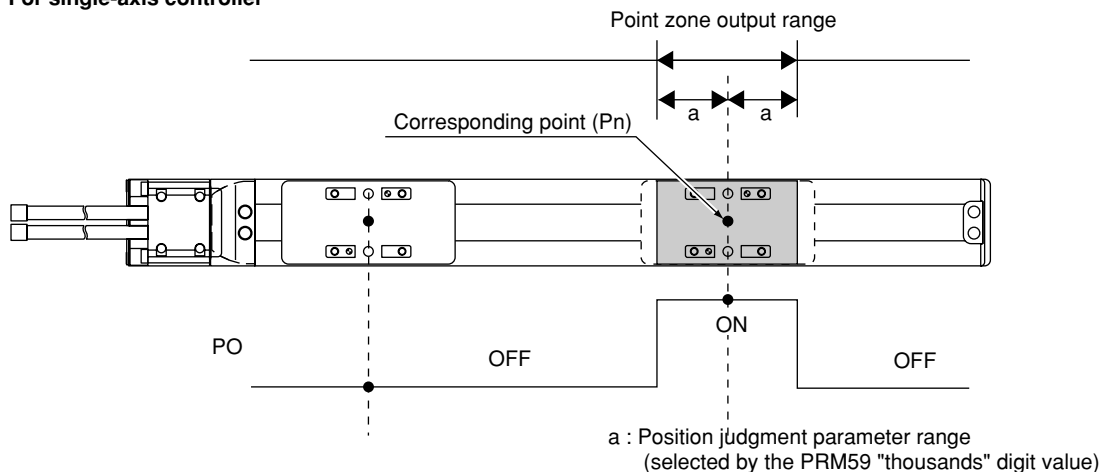
These are the output signals for the point movement command (ABS-PT, INC-PT) target position point numbers, and for the point numbers corresponding to the point zone output and movement point zone output functions. (For details on ABS-PT and INC-PT commands, see 2-7-2, "Dedicated command input" in this chapter.)

The "point zone output function" outputs the corresponding point number to the PO when the robot enters the point zone output range (corresponding point $\pm$ position judgment parameter range). The corresponding point of this point zone output range is the point data registered at the controller.

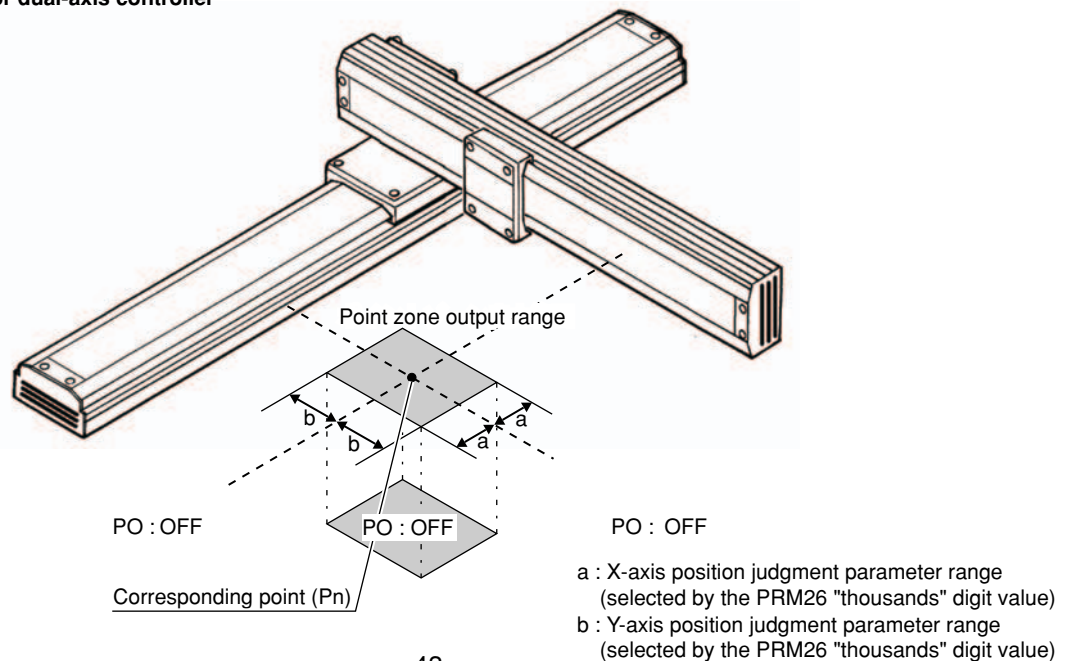
Moreover, the point zone output range's corresponding point can be further narrowed to correspond to point movement commands (ABS-PT, INC-PT), with the point number being output to the PO. This is referred to as the movement point zone output function.

Point zone output function

For single-axis controller



For dual-axis controller



Target position point numbers for point movement commands (ABS-PT, INC-PT) are output as binary values. The same applies to point numbers which correspond to the point zone output function and the movement point zone output function. The PO output format is specified in the "hundreds" place of the I/O assignment selection parameter setting (single-axis controllers: PRM59, dual-axis controllers: PRM26)

- 0: PO output occurs at normal movement completion.
- 1: PO output occurs when movement command is received.
- 2: Point zone output
(PO output occurs when the current position enters the point data (registered at the controller) $\pm$ position judgment parameter range.)
- 3: Movement point zone output
(PO output occurs when the current position enters the point data registered at the controller, and the point movement command's (ABS-PT, INC-PT) movement point data $\pm$ position judgment parameter range.)

MEMO

The movement point zone output function is supported by the following controller versions.

ERCX, SRCX : Ver. 13.64 or later DRCX : Ver. 18.64 or later
 SRCP, SRCD : Ver. 24.21 or later SRCP30 : Ver. 24.30H or later

Output example

PO No. Point No.	PO205 (2 ⁵)	PO204 (2 ⁴)	PO203 (2 ³)	PO202 (2 ²)	PO201 (2 ¹)	PO200 (2 ⁰)
P0	OFF	OFF	OFF	OFF	OFF	OFF
P1	OFF	OFF	OFF	OFF	OFF	ON
P7	OFF	OFF	OFF	ON	ON	ON
P31	OFF	ON	ON	ON	ON	ON
P63	ON	ON	ON	ON	ON	ON

CAUTION

When using PO as an output signal that indicates the target position's point number for point movement commands (ABS-PT, INC-PT):

- If moving the robot to point 0 with at the first point movement command which is executed after turning the controller on, all the PO200 to PO205 signals still remain off (because P0 = 000000 (binary)) even after the robot has moved to point 0. This means that the PO200 to PO205 signal statuses do not change even after the robot has moved to P0, so no information is available to indicate whether the robot motion to P0 is complete (or whether the movement command was received). This should be kept in mind when moving the robot to point 0.

When using PO as an output signal that indicates the corresponding point number at the point zone output function or the movement point zone output function:

- If outputting point 0 (P0) as the corresponding point for the point zone output function or the movement point zone output function, all the PO200 to PO205 signals remain off (because P0 = 000000 (binary)). This means that the PO200 to PO205 signal statuses do not change even after the robot has entered the zone specified by P0. This should be kept in mind when monitoring P0.

MEMO

When using PO as an output signal that indicates the target position's point number for point movement commands (ABS-PT, INC-PT):

- When a point movement is received through a parallel I/O, the target position's point number is output to the corresponding parallel I/O (PO0 to PO5). When received through a serial I/O such as a CC-Link, the target position's point number is output to the corresponding serial I/O (PO200 to PO205).
- All PO outputs are reset (OFF) when a program reset is performed.

When using PO as an output signal that indicates the corresponding point number at the point zone output function:

- The corresponding point number for the point zone output function is output to both the corresponding parallel I/O (PO0 to PO5) and the serial I/O (PO200 to PO205). In the SRCP/SRCD series, however, the point number is only output to the serial I/O.
- All PO outputs are reset (OFF) when a program reset is performed.

When using PO as an output signal that indicates the corresponding point number at the movement point zone output function:

- The corresponding point number for the movement point zone output function is output to both the corresponding parallel I/O (PO0 to PO5) and the serial I/O (PO200 to PO205). In the SRCP/SRCD series, however, the point number is only output to the serial I/O.
- Movement points are reset immediately after a controller power on, and all PO outputs are therefore turned off at that time. Movement points are also reset if a program reset is performed, and the movement point zone PO outputs are reset (OFF) at that time as well.

■ Return-to-origin complete output / Zone output 0 (ORG-O / ZONE0)

This output notifies that return-to-origin operation is complete. When Zone 0 output is enabled with the Zone output selection parameter (single-axis controllers: PRM53, dual-axis controllers: PRM24), the ORG-O output is used as the output port of Zone 0 (ZONE0).

The ORG-O output is an output signal having the same function as bit 6 of the output channel "n". For details on the output signal, refer to "Return-to-origin status output (ORG-O)" in "2-7-7 Dedicated output".

The ZONE0 output is an output signal having the same function as bit 1 of the output channel "n". For details on the output signal, refer to "Zone output (ZONE0 to ZONE3)" in "2-7-7 Dedicated output" and also to "Zone output selection" described in the controller user's manual.

■ Servo status output / Zone output 1 (SRV-O / ZONE 1)

This is the servo status output. When Zone 1 output is enabled with the Zone output selection parameter (single-axis controllers: PRM53, dual-axis controllers: PRM24), the SRV-O output is used as the output port of Zone 1 (ZONE1).

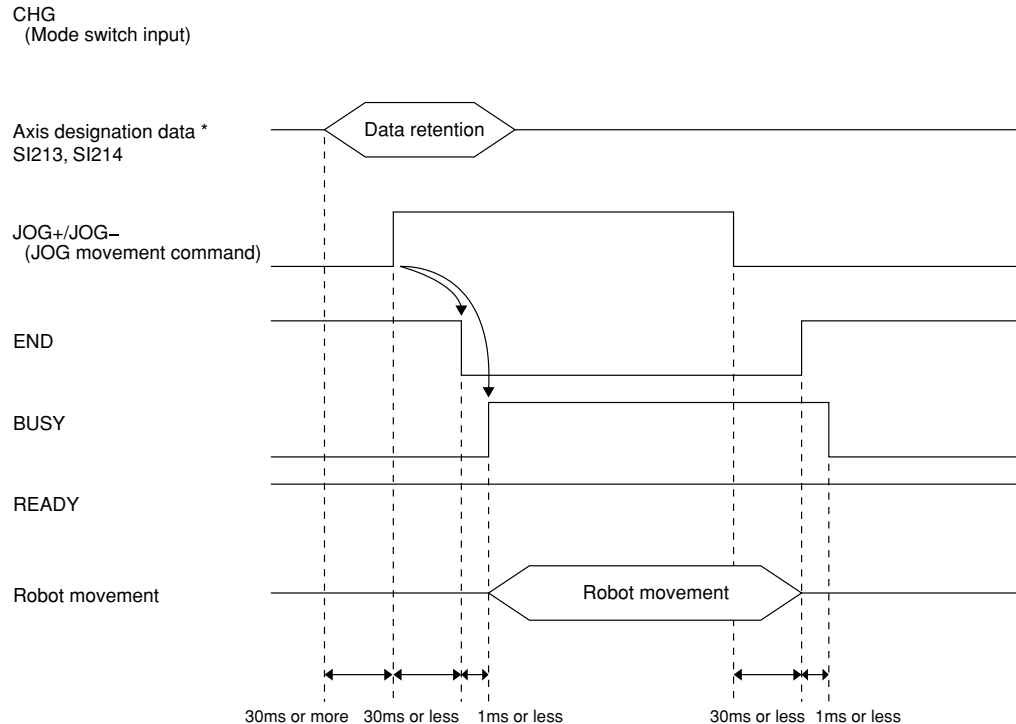
The SRV-O output is an output signal having the same function as bit 0 of the output channel "n". For details on the output signal, refer to "Servo status output (SRV-O)" in "2-7-7 Dedicated output".

The ZONE1 output is an output signal having the same function as bit 2 of the output channel "n". For details on the output signal, refer to "Zone output (ZONE0 to ZONE3)" in "2-7-7 Dedicated output" and also to "Zone output selection" described in the controller user's manual.

2-9-5 Timing chart

This section shows timing charts for the operations that are added by changing the I/O assignment.

■ Jog movement (JOG+, JOG-)



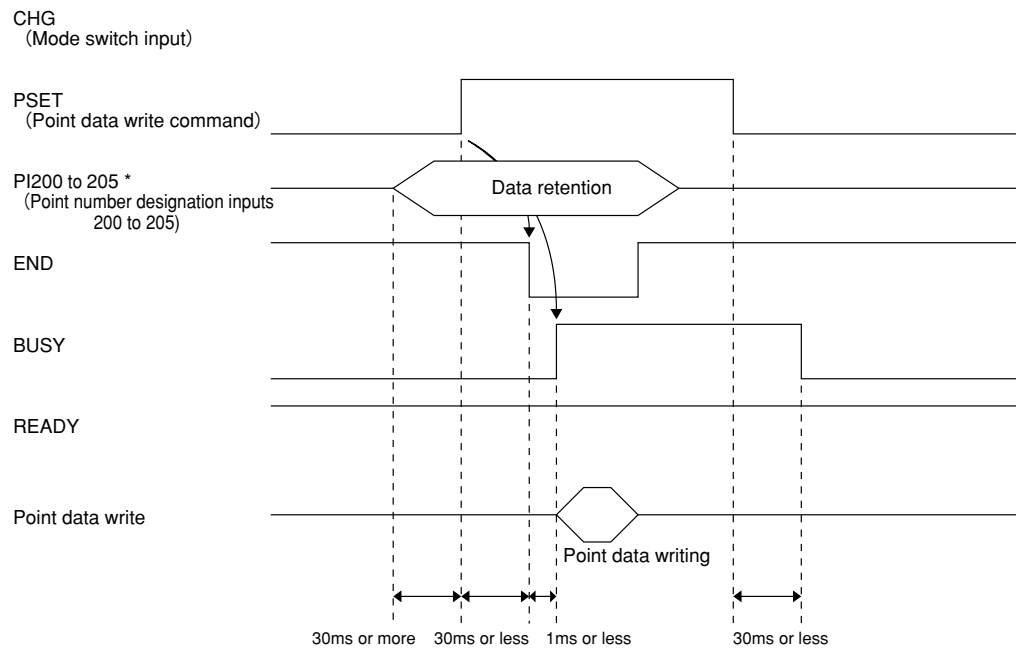
* For dual-axis controllers only. In the case of dual-axis controllers, the X-axis is usually used for jog movement. However, the Y-axis can be specified with SI213 and SI214 by enabling PRM10 (Control axis selection with I/O command).

- (1) Turn on the CHG signal.
- (2) To specify the movement axis by a dual-axis controller, input the axis designation data to SI213 and SI214.
 - The input status specified here must be kept unchanged until step (4) is complete. If this input status is changed, the controller might misrecognize the data.
- (3) Turn on the JOG+ (or JOG-) input signal while the CHG signal is on.
- (4) The END signal turns off and the BUSY signal turns on, indicating that the controller received the jog movement command.
- (5) The robot moves in jog mode as long as the JOG+ (or JOG-) input signal is on.
- (6) Turn off the JOG+ (or JOG-) input signal.
- (7) Wait until the BUSY signal turns off.
- (8) The BUSY signal turns off. The END signal should be on at this point, indicating that the jog movement is normally complete.

⚠ CAUTION

- If the CHG signal is switched during execution of a jog movement command (JOG+, JOG-), the robot comes to an error stop and the END signal remains off.
- When specifying the axis, the SI213 and SI214 status must be checked beforehand. (Refer to "PRM10: Control axis selection with I/O command" in the DRCX controller user's manual.

■ Point data write (PSET)



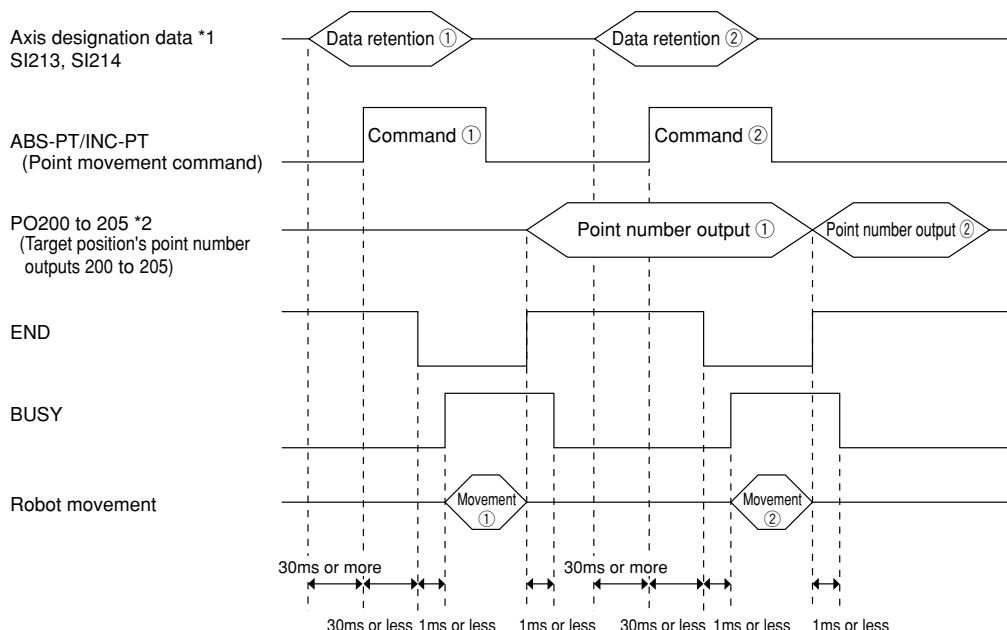
* The number of point number outputs that can be used depends on the I/O assignment type.

Precondition: The CHG signal is on before and during point data writing (until the following procedure is complete).

- (1) Designate the point number input (PI200 to PI205) to write the point data.
 - The point numbers that can be used depend on the I/O assignment type. Refer to the I/O assignment list in "2-9-2 Changing the I/O assignment".
 - The input status for designating the point number must be kept unchanged until step (3) is complete. If this input status is changed, the controller might misrecognize the data.
- (2) After 30ms or more has elapsed, turn on the PSET.
- (3) The END signal turns off and the BUSY signal turns on, indicating that the controller received the point data write command.
- (4) Turn off the PSET.
- (5) Wait until the BUSY signal turns off.
- (6) The BUSY signal immediately turns off since point data writing is already finished. The END signal should be on at this point, indicating that the point data writing was completed normally.

■ Target position's point number output (PO)

(1) Outputting the point number at the timing that movement is normally completed



*1 For dual-axis controllers only. In the case of dual-axis controllers, all axes are usually used for movement. However, the desired axis can be specified with SI213 and SI214 by enabling PRM10 (Control axis selection with I/O command).

*2 The number of point number outputs that can be used depends on the I/O assignment type.

Precondition: 1) The following steps are explained assuming that the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26) is set to 30.

When I/O assignment selection parameter = 30 (single-axis controllers: PRM59, dual-axis controllers: PRM26)	
I/O assignment type	Type 3 (point teaching type)
Permissible number of movement points	64 points
Point output selection	Point No. output to PO when movement ends normally

2) The point numbers of the target positions are designated before running a point movement command (ABS-PT, INC-PT).

[Point movement command execution ①]

- (1) To specify the movement axis by a dual-axis controller, input the axis designation data to SI213 and SI214.
 - The input status specified here must be kept unchanged until step (3) is complete. If this input status is changed, the controller might misrecognize the data.
- (2) Turn on the ABS-PT (or INC-PT).
- (3) The END signal turns off and the BUSY signal turns on, indicating that the controller received the point movement command.
- (4) Turn off the ABS-PT (or INC-PT).
- (5) Wait until the BUSY signal turns off.
- (6) The BUSY signal turns off. The END signal should be on at this point, indicating that the point movement is normally finished.
- (7) When the END signal is on in step (6), the target position's point number is output from the specified point number (PO200 to PO205).
 - The output status of the target position's point number is retained until execution of the next point movement command is complete.



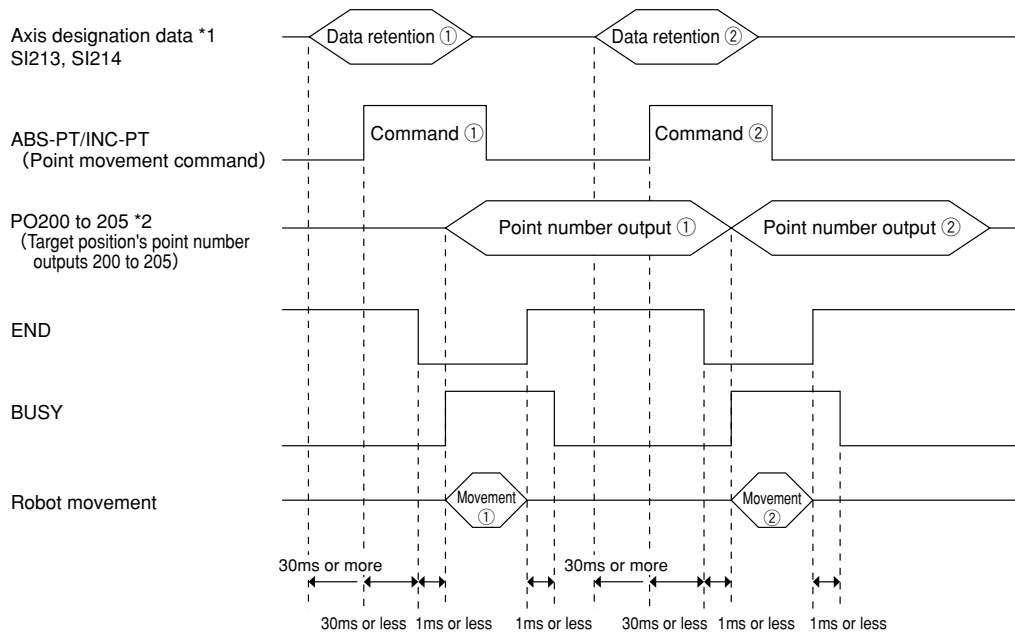
[Point movement command execution ②]

- (8) Execute the next point movement command.
- (9) Point movement ends.
- (10) The END signal turns on. The previous target position's point number being output from the specified point number (PO200 to PO205) is cleared and the current target position's point number is then output.

⚠ CAUTION

- If moving the robot to point 0 with a point movement command that is first executed after turning on the controller, all of PO200 to PO205 still remain off (because $P0 = 000000$ (binary)) even after the robot has moved to point 0. This means that the PO200 to PO205 status does not change even after the robot has moved to P0, so no information is available to indicate whether the robot motion to P0 is complete (or whether the movement command was received). This should be kept in mind when moving the robot to point 0.
- When specifying the axis, the SI213 and SI214 status must be checked beforehand. (Refer to "PRM10: Control axis selection with I/O command" in the DRCX controller user's manual.)

(2) Outputting the point number at the timing that a movement command is received



*1 For dual-axis controllers only. In the case of dual-axis controllers, all axes are usually used for movement. However, the desired axis can be specified with SI213 and SI214 by enabling PRM10 (Control axis selection with I/O command).

*2 The number of point number outputs that can be used depends on the I/O assignment type.

Precondition: 1) The following steps are explained assuming that the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26) is set to 130.

When I/O assignment selection parameter = 130 (single-axis controllers: PRM59, dual-axis controllers: PRM26)	
I/O assignment type	Type 3 (point teaching type)
Permissible number of movement points	64 points
Point output selection	Point No. output to PO when movement command is received

- 2) The point numbers of the target positions are designated before running a point movement command (ABS-PT, INC-PT).

[Point movement command execution ①]

- (1) To specify the movement axis by a dual-axis controller, input the axis designation data to SI213 and SI214.
 - The input status specified here must be kept unchanged until step (3) is complete. If this input status is changed, the controller might misrecognize the data.
- (2) Turn on the ABS-PT (or INC-PT).
- (3) The END signal turns off and the BUSY signal turns on, indicating that the controller received the point movement command.
- (4) When the BUSY signal turns on in step (3), the target position's point number is output from the specified point number (PO200 to PO205).
 - The output status of the target position's point number is retained until the next point movement command is received.
- (5) Turn off the ABS-PT (or INC-PT).
- (6) Wait until the BUSY signal turns off.
- (7) The BUSY signal turns off. The END signal should be on at this point, indicating that the point movement finished normally.



[Point movement command execution ②]

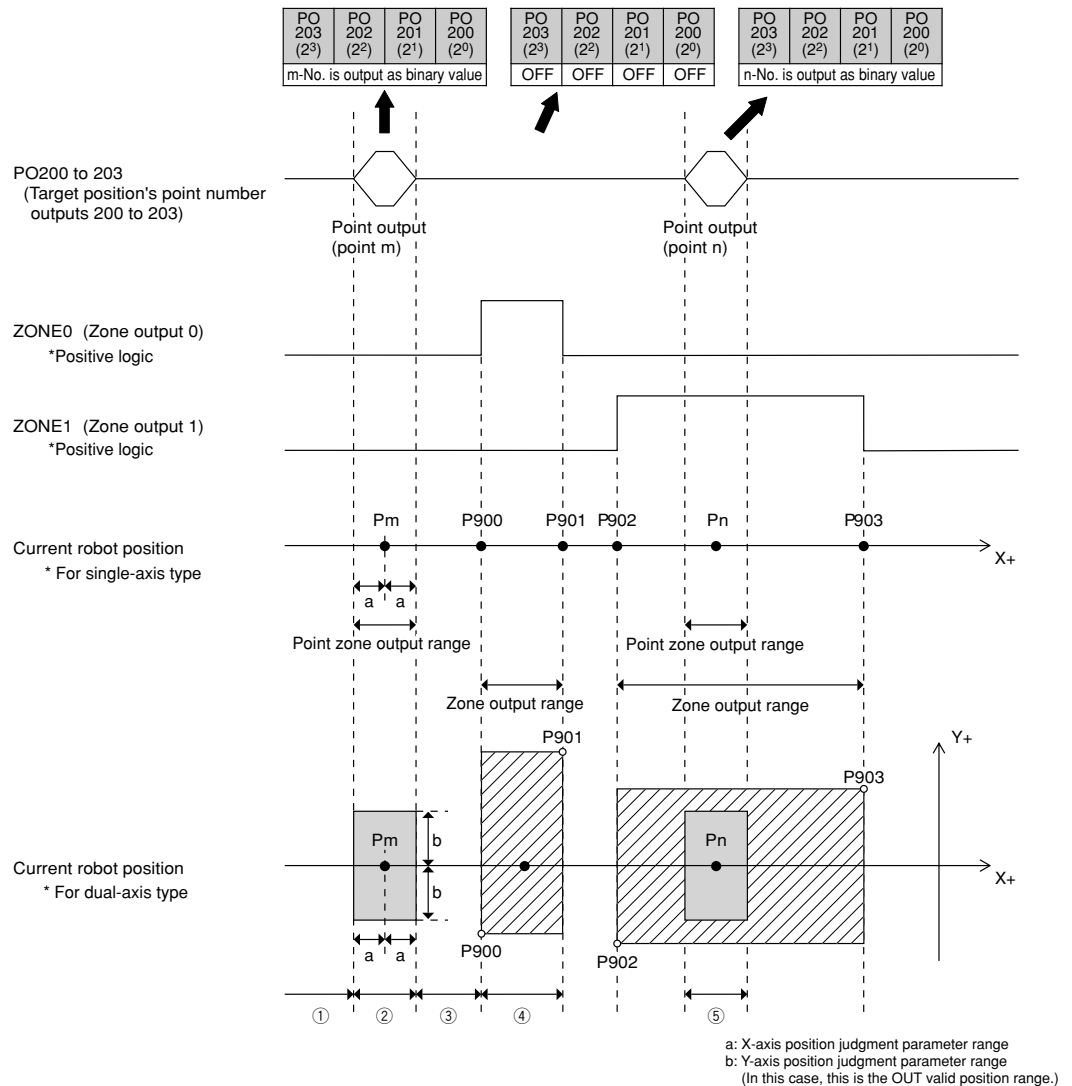
- (8) Execute the next point movement command.
- (9) When the controller received the point movement command and the BUSY signal turned on, the previous target position's point number being output from the specified point number (PO200 to PO205) is cleared and the current target position's point number is then output.

** CAUTION**

- If moving the robot to point 0 by specifying it with a point movement command that is first executed after turning on the controller, all of PO200 to PO205 still remain off (because P0 = 000000 (binary)) even after the robot has moved to point 0. This means that the PO200 to PO205 status does not change even after specifying P0 as the target position, so no information is available to indicate whether the movement command to P0 was received. This should be kept in mind when moving the robot to point 0.
 - When specifying the axis, the SI213 and SI214 status must be checked beforehand. (Refer to "PRM10: Control axis selection with I/O command" in the DRCX controller user's manual.
-

(3) Outputting the corresponding point number by the point zone output function

Zone outputs (ZONE 0, ZONE 1) are also explained here.



* The number of target point number outputs that can be used depends on I/O assignment type.

Precondition: 1) The following steps are explained assuming that the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26) is set to 221.

When I/O assignment selection parameter = 221 (single-axis controllers: PRM59, dual-axis controllers: PRM26)	
I/O assignment type	Type 2 (Point No. output type)
Permissible number of movement points	16 points
Point output selection	Point zone output
Point zone judgment method (position judgment parameter)	OUT valid position

2) The Zone 0 output and Zone 1 output are enabled and set to positive logic output by the Zone output selection parameter (single-axis controllers: PRM53, dual-axis controllers: PRM24).

- (1) Target position's point number outputs PO200 to PO203 are off since the current robot position is not within the point zone output range. ZONE 0 and ZONE 1 output signals are also off since the robot does not yet enter the zone output range.

- (2) Outputs the corresponding point number through PO200 to PO203 since the current robot position is within the point zone output range ($P_m \pm \text{OUT}$ valid position range). ZONE 0 and ZONE 1 output signals are still off since the robot does not yet enter the zone output range.
- (3) As with (1), all the target position's point number outputs PO200 to PO203, ZONE 0 signal and ZONE 1 output signal are off.
- (4) ZONE 0 output signal turns on since the current robot position is within the zone output range (P900 to P901). (ZONE 1 signal remains off since the robot is not within the zone output range of P902 to P903). At this point, the target position's point number outputs PO200 to PO203 are still off since the robot is not within the point zone output range.
- (5) Outputs the corresponding point number through PO200 to PO203 since the current robot position is within the zone output range (P902 to P903) and also within the point output range ($P_n \pm \text{OUT}$ valid position range). At this point, ZONE 1 output signal turns on. (ZONE 0 output signal turns off since the robot is not within the zone output range of P900 to P901).

MEMO

- When using an option unit, the corresponding point number for the point zone output function is output to both the corresponding parallel I/O (PO0 to PO5) and the serial I/O (PO200 to PO205). In the SRCP/SRCD series, however, the point number is only output to the serial I/O.
- In controllers of the following versions, the position judgment parameter for selecting the point judgment method can be set to either "OUT valid position" or "Positioning-completed pulse" (this is specified in the "thousands" place of the I/O assignment selection parameter). In controllers prior to the following versions, the point zone judgment method (specified by the position judgment parameter) can only be set to "OUT valid position".

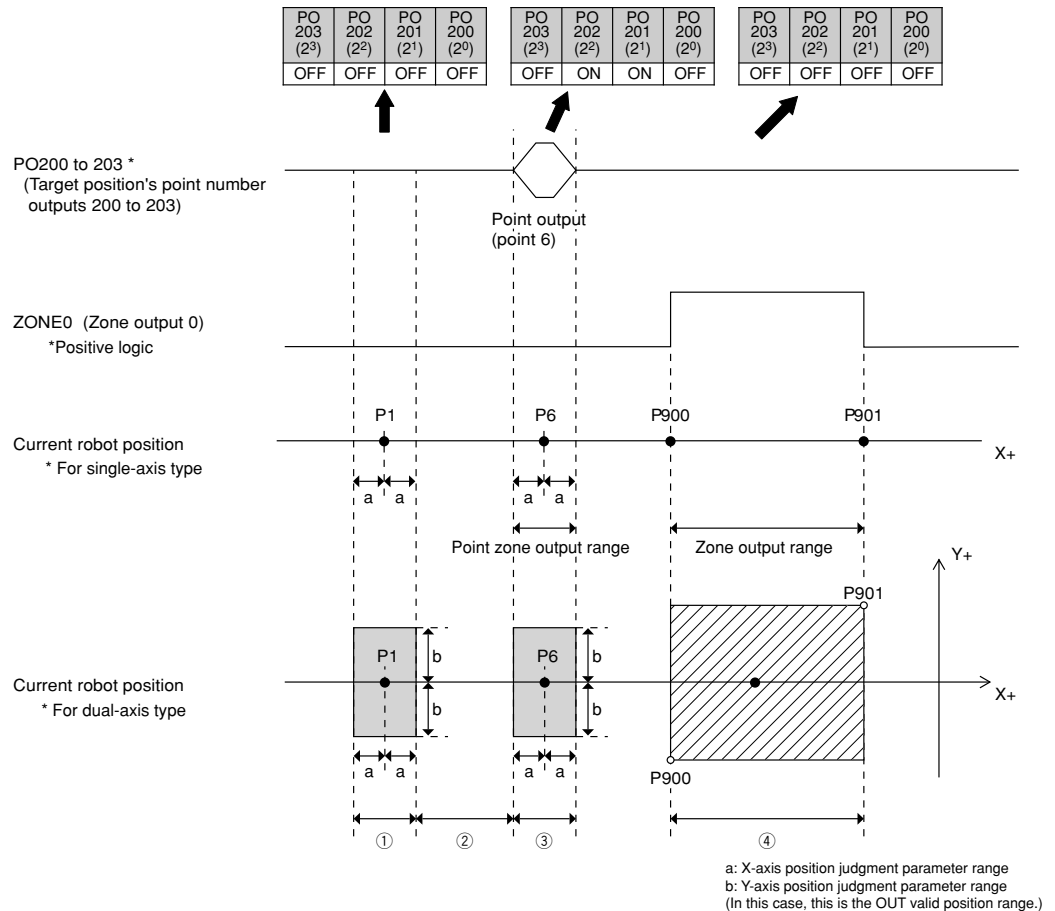
ERCX, SRCX	: Ver. 13.64 or later	DRCX	: Ver. 18.64 or later
SRCP, SRCD	: Ver. 24.21 or later	SRCP30	: Ver. 24.30H or later
- The "OUT valid position" can be changed by parameter setting (single-axis controllers: PRM20, dual-axis controllers: PRM56 for X-axis, PRM96 for Y-axis).
- The "Positioning-completed pulse" can be changed parameter setting (single-axis controllers: PRM6, dual-axis controllers: PRM53 for X-axis, PRM93 for Y-axis).

CAUTION

- When the current robot position is within two or more point zone output ranges, the smaller or smallest point number is output.
 Example : If the current robot position is within two point output ranges specified by P2 and P5, then P2 is output.
- If the current robot position is not within any point output range, all of PO200 to PO205 turn off.
- A 10ms sampling time is needed for position monitoring, so the point zone output might not be detected when moving the robot at high speeds.
- For point zone output and zone output, PO and ZONE0 to ZONE3 are output only when the all axes of the robot are within the output range specified for each zone.
- If outputting point 0 (P0) as the corresponding point for the point zone output function, all of PO200 to PO205 remain off (because $P0 = 000000$ (binary)). This means that the PO200 to PO205 status does not change even after the robot has entered the zone specified by P0. This should be kept in mind when monitoring P0.

(4) Outputting the corresponding point number by the movement point zone output function

Zone outputs (ZONE 0) are also explained here.



Precondition: 1) The following steps are explained assuming that the I/O assignment selection parameter (single-axis controllers: PRM59, dual-axis controllers: PRM26) is set to 321.

When I/O assignment selection parameter = 321 (single-axis controllers: PRM59, dual-axis controllers: PRM26)	
I/O assignment type	Type 2 (Point No. output type)
Permissible number of movement points	16 points
Point output selection	Movement point zone output
Point zone judgment method (position judgment parameter)	OUT valid position

- 2) The Zone 0 output is enabled and set to positive logic output by the Zone output selection parameter (single-axis controllers: PRM53, dual-axis controllers: PRM24).
- 3) Set the movement point as P6.

- (1) Although the robot is within the $P1 \pm \text{OUT}$ valid position range (point zone output range), all the PO200 to PO203 target position point number outputs are off because P1 is not the movement point. Moreover, the ZONE 0 output is also off because the robot is not within the specified zone output range.
- (2) All the PO200 to PO203 target position point number outputs are off because the robot is not within the point zone output range. Moreover, the ZONE 0 output is also off because the robot is not within the specified zone output range.

- (3) The corresponding point number P6 is output to PO200 through PO203 (P201, P202 are on; P200, P203 are off) because the robot is within the $P6 \pm \text{OUT}$ valid position range (point zone output range), and because P6 is the movement point. ZONE 0 remains off at this time because the robot is not within the specified zone output range.
- (4) The ZONE 0 output turns on because the robot is within the specified zone output range (P900 to P901). All the PO200 to PO203 target position point number outputs are off at this time because the robot is not within any point zone output range.

MEMO

- The movement point zone output function is supported by the following controller versions.
 ERCX, SRCX : Ver. 13.64 or later DRCX : Ver. 18.64 or later
 SRCP, SRCD : Ver. 24.21 or later SRCP30 : Ver. 24.30H or later
- When using an option unit, the corresponding point number for the movement point zone output function is output to both the corresponding parallel I/O (PO0 to PO5) and the serial I/O (PO200 to PO205). In the SRCP/SRCD series, however, the point number is only output to the serial I/O.
- The movement point number specified just prior to movement START by point movement command (ABS-PT, INC-PT) is registered as the movement point.
- Because movement points are reset immediately after a controller power on, all PO outputs turn off. Movement points are also reset when the RESET command is executed, and movement point zone outputs by PO are cleared.
- The position judgment parameter for selecting the point zone judgment method can be set to either "OUT valid position" or "Positioning-completed pulse" (this is specified in the "thousands" place of the I/O assignment selection parameter).
- The "OUT valid position" can be changed by parameter setting (single-axis controllers: PRM20, dual-axis controllers: PRM56 for X-axis, PRM96 for Y-axis).
- The "Positioning-completed pulse" can be changed parameter setting (single-axis controllers: PRM6, dual-axis controllers: PRM53 for X-axis, PRM93 for Y-axis).

CAUTION

- All the PO200 to PO205 outputs are off when the robot is not within the point zone output range.
- A 10ms sampling time is needed for position monitoring, so the point zone output may not be detected during high-speed robot motion.
- For movement point zone output and zone output, PO and ZONE0 to ZONE3 are output only when the all axes of the robot are within the output range specified for each zone.
- When outputting point 0 (P0) as the corresponding point for the movement point zone output function, all the PO200 to PO205 outputs remain off (because $P0 = 000000_{(\text{binary})}$). Therefore, the PO200 to PO205 statuses do not change even after the robot has entered the zone specified by P0. This should be kept in mind when monitoring P0.

2-10 Robot language

The robot language expanded by using in the DeviceNet unit.

2-10-1 MOVF

Function: Moves until the specified DI or SI No. is input.

Format: MOVF <point no.> <DI or SI No.> <input status>

Example: MOVF 1,2,1

This command moves the robot towards P1, ends movement when D12 turns ON, and proceeds to the next step.

Explanation: MOVF is used when searching for the target position with sensors, etc.

The robot starts movement when all axes enter the positioning-complete pulse range, and stops when the SI and DI conditions are met. Even if the SI or DI conditions are not met, the command ends at the stage the robot reaches the specified point, and proceeds to the next step.

(1) Point numbers

Point numbers are identifying numbers assigned to 1,000 points in a range from 0 to 999. These point numbers are used to create point data in point mode. As a special usage method, when a character called 'P' is input here, a point variable defined by the P character is set in the point No.

(2) DI or SI numbers

Specify one from among serial general-purpose inputs 200 - 215 (16 points) or general-purpose inputs 0 - 15 (16 points)*.

(3) Input status

Here, "1" means "ON", and "0" means "OFF".

Other:

- The speed during execution of the MOVF statement can be set with the MOVF speed parameter. This has no effect on speed in OPRT mode.

* 0 to 7 (8 points) for the SRCP/SRCD series controllers

2-10-2 JMPF

Function: Jumps to the specified label of the specified program when the jump condition input matches the value that was set.

Format: JMPF <label No.> <program No.> <input condition value>

Example: JMPF 12,3,5

Jumps to label 12 of program 3 when the condition jump input value is 5. If not, proceeds to the next step.

Explanation: JMPF is a command to control the program flow according to the condition jump input.

(1) Label No.

The label No. is a number defined by the character L, and signifies the jump destination. This number can be specified from 0 to 255.

(2) Program No.

The program numbers are numbers assigned to 100 programs ranging from 0 to 99.

(3) Input condition value

This value sets the condition for the jump. A general-purpose input or a serial general-purpose input is considered a binary input value, and the jump is performed if it matches the input value conditions. The number of points that can be sub-grouped by input condition depends on the number of conditional input points. The number of conditional input points is set by the conditional input point parameter (single-axis controllers: PRM8, dual-axis controllers: PRM0).

Others: • The conditional input point parameters have been expanded as follows.

Input range: 1 - 8, 11 - 18

Initial value: 4

Conditional input points - general-purpose input and condition range

Conditional input points	General-purpose inputs used	Settable conditional input range
1	DI0	0-1
2	DI0-DI1	0-3
3	DI0-DI2	0-7
4	DI0-DI3	0-15
5	DI0-DI4	0-31
6	DI0-DI5	0-63
7	DI0-DI6	0-127
8	DI0-DI7	0-255
11	SI200	0-1
12	SI200-SI201	0-3
13	SI200-SI202	0-7
14	SI200-SI203	0-15
15	SI200-SI204	0-31
16	SI200-SI205	0-63
17	SI200-SI206	0-127
18	SI200-SI207	0-255

2-10-3 JMPB

Function: Jumps to the specified label when the specified general-purpose input or memory input or serial general-purpose input is on (or off).

Format: JMPB <label No.> <DI or MI or SI No.> <input status>

Example: JMPB 12,8,1

Jumps to level 12 when D18 is "ON". If not, proceeds to the next step.

Explanation: JMPB is a command to control the program flow according to the general-purpose input or memory input or serial general-purpose input.

(1) Label No.

The label No. is a number defined by the character L, and signifies the jump destination. This number can be specified from 0 to 255.

(2) DI or MI or SI No.

Specify 1 number from among the general-purpose inputs 0 - 15 (16 points)* or memory input 100 -147 (48 points) or the serial general-purpose inputs 200- 215 (16 points).

(3) Input status

Here, "1" means "ON", and "0" means "OFF".

* 0 to 7 (8 points) for the SRCP/SRCD series controllers

2-10-4 DO

Function: Turns the general-purpose output or memory output or serial general-purpose output on or off.

Format: DO <DO or MO or SO No.> <Output status>

Example: DO 3,1

Sets DO3 to "ON".

Explanation: The DO command turns the general-purpose output or memory output or serial general-purpose output "ON" or "OFF".

(1) DO or MO or SO No.

Specify one from among the general-purpose outputs 0 - 12 (13 points)* or memory output 100 -131 (32 points) or the serial general-purpose outputs 200- 215 (16 points).

(2) Output status

Here, "1" means ON, and "0" means OFF.

* 0 to 4 (5 points) for the SRCP/SRCD series controllers

2-10-5 WAIT

Function: Waits until the specified general-purpose input or memory input or serial general-purpose input sets to the specified status.

Format: WAIT <DI or MI or SI No.> <Input status>

Example: WAIT 5,1

Waits until DI5 sets to "ON".

Explanation: The WAIT command adjusts the timing according to the status of the general-purpose input or memory input or serial general-purpose input.

(1) DI or MI or SI numbers

Specifies one from among the general-purpose inputs 0 - 15 (16 points)* or memory input 100 -147 (48 points) or the serial general-purpose outputs 200- 215 (16 points).

(2) Input status

Here, " 1" means the input is "ON", and "0" means the input is "OFF".

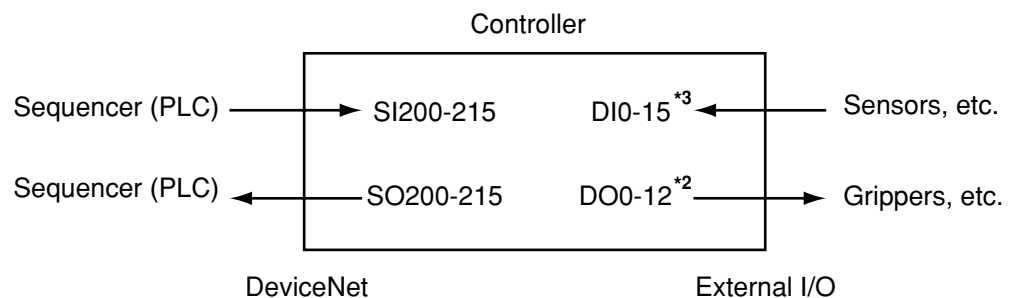
* 0 to 7 (8 points) for the SRCP/SRCD series controllers

2-11 Emulated Serialization on parallel DIO

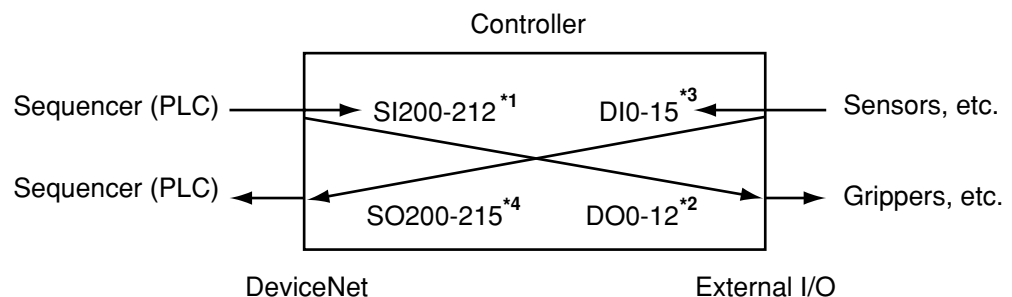
This is a function to directly send the input from the master sequencer (PLC) to the external parallel I/O, or to directly send an external parallel I/O input to a master sequencer (PLC). An I/O port set for this function, can be controlled by the master sequencer (PLC), independently of the robot program so outputs can be handled as if from a separate Slave station.

This function is selected on the HPB, and can be set for any I/O. The SI200 - SI212*¹ inputs match the DO0 - DO12*² outputs, and the DI0 - DI15*³ inputs match the SO200 - SO215*⁴ outputs. (Emulated serialization cannot be performed on SI213 - SI215*⁵.)

Normal



Emulated serialization



More specifically, when emulated serialization is only for DI1, the DI1 status is output to SO201. Output of SO201 with the DO statement is disabled at this time. DI0, DI2 - DI15 and SO200, SO202 - SO215 can be used as normal input/outputs.

- * The DO statement is invalid on output ports that used emulated serialization on a parallel I/O.
- * Do not make simultaneous function settings with parameters such as for emulated serialization parallel I/O settings, origin return end action selection and servo status output selection, and alarm number output selection since the functions will not operate normally.

- *1: SI200 to SI204 when the SRCP/SRCD series controllers are used.
- *2: DO0 to DO4 when the SRCP/SRCD series controllers are used.
- *3: DI0 to DI7 when the SRCP/SRCD series controllers are used.
- *4: SO200 to SO207 when the SRCP/SRCD series controllers are used.
- *5: SI205 to SI215 when the SRCP/SRCD series controllers are used.

- 1) Press **F3** (SYS) on the initial screen.

```
[MENU]

select menu

1EDIT2OPRT3SYS 4MON
```

- 2) Press **F4** (next) to switch to the function display. When the function display appears, then press **F2** (OPT).

```
[SYS]

select menu

1SAFE2OPT 3UTL 4next
```

- 3) Press **F4** (next) to switch the function display. To directly send the external parallel I/O input to the master sequencer (PLC) press **F1** (D→SO). To directly send the input from the master sequencer (PLC) to the external parallel I/O, press **F2** (S→DO).

```
[SYS-OPT]

select menu

1D-SO2S-DO3 4next
```

- 4) This is the screen when **F1** (D→SO) was selected above in step 3). The DI15 - DI0 current settings appear on the screen from the left side. Here, "0" indicates normal status, and "1" indicates a emulated serialization setting.

To change a setting, press the function key displaying the DI No. you want to set. If the DI No. you want to set is not shown, just press the **F4** (next) as many times as needed to select DI3 - DI15.

```
[SYS-OPT-D-SO]

DI 00001111 00000000

DI-SO connect

1DI0 2DI1 3DI2 4next
```

- 5) This is the screen when **F2** (S→DO) was selected above in step 3). The DO12 - DO0 current settings appear on the screen from the left side. Here, "0" indicates normal status, and "1" indicates a emulated serialization setting.

To change a setting, press the function key displaying the DI No. you want to set. If the DI No. you want to set is not shown, just press the **F4** (next) as many times as needed to select DO3 - DO12.

```
[SYS-OPT-S-DO]

DO 00011 00000000

SI-DO connect

1DO0 2DO1 3DO2 4next
```

- 6) Press the **ESC** key to return to the screen in step 3).

```
[SYS-OPT]

select menu

1D-SO2S-DO3 4next
```

2-12 Other operations

2-12-1 Serial I/O display

Serial I/O (input/output) status can be displayed on the screen.

- 1) Press **F2** (OPRT) on the initial screen.

```
[MENU]
select menu

1EDIT2OPRT3SYS 4MON
```

- 2) Next, press **F2** (STEP) or **F3** (AUTO).
The step operation screen is explained in the subsequent steps.

```
[OPRT]
select menu

1ORG 2STEP3AUTO
```

- 3) Press **F4** (next) 2 times to switch to the function table, and then press **F2** (SIO).

```
[OPRT-STEP] 100 0: 0
001:MOVA 254,100
[ 0.00, 0.00]
1MIO 2SIO 3 4next
```

- 4) The screen continues displaying the status of each serial I/O.
From the upper left, the screen shows the status of bit 15 to bit 0 at input "n" channel, bit 15 to bit 0 at input "n+1" channel, bit 15 to bit 0 at input "m" channel, and bit 15 to bit 0 at input "m+1" channel.

```
SI 00000000 00000000
    00000000 00000000
SO 00000000 00000000
    00000000 00000000
```

- 5) Press the **ESC** key to return to the previous screen.

```
[OPRT-STEP] 100 0: 0
001:MOVA 254,100
[ 0.00, 0.00]
1MIO 2SIO 3 4next
```

2-12-2 Manual control of general-purpose output

The serial general-purpose output can be manually controlled from HPB.

- 1) Press **F1** (EDIT) on the initial screen.

```
[MENU]
select menu

1EDIT2OPRT3SYS 4MON
```

- 2) Press **F2** (PNT).

```
[MENU]
select menu

1PGM 2PNT 3UTL
```

- 3) Press **F2** (TCH) or **F3** (DTCH).

The teaching play back screen is explained in the subsequent steps.

```
[EDIT-PNT]
select menu

1MDI 2TCH 3DTCH4DEL
```

- 4) During movement of the robot, it reaches the position where the general-purpose output is desired for operation. At this time, stop the operation once, and press **F2** (DO).

```
[EDIT-PNT-TCH] (1) 50
P0 X=0.00 [mm]
[ 0.00, 0.00]
1CHG 2DO 3Y 4next
```

- 5) The current status of the general-purpose output appears on the screen. Just press **F4** (next) as many times as needed to select SO200 to SO215.

Press the function key displaying the SO number desired to control to highlight the output status.

```
[EDIT-PNT-TCH] (1) 50
SO 200=0 201=0 202=0
SO 203=0 204=0 205=0
1S2002S2013S2024next
```

- 6) To return to the screen in step 4), press **ESC**.

```
[EDIT-PNT-TCH] (1) 50
P0 X=0.00 [mm]
[ 0.00, 0.00]
1CHG 2DO 3Y 4next
```

* The manual control is invalid on the port that used emulated serialization on a parallel I/O.

2-13 Error message

The following error message was added to the DeviceNet system.

Error No. 38	Message (English)	net link error
	Cause	A network connection error occurred so the connection was canceled.
	Remedy	Correct the network problem and then rerun.

2-14 Troubleshooting

Check the following items if any problems occur during operation. Also, refer to "Troubleshooting" in the controller instruction manual and always refer to the section on troubleshooting in the master station sequencer (PLC) instruction manual. If the following items do not eliminate the problem, promptly contact your Yamaha dealer or Yamaha for assistance.

No.	Symptom	Causes	Checkpoints	Remedy
1	When using the master station sequencer line test function, unable to verify from the master station sequencer (PLC), that the controller is correctly connected to the DeviceNet system.	1) DeviceNet cable not correctly connected.	• Check if DeviceNet cable is not connected, is miswired, or wires are broken.	• Correctly repair any miswirings or unconnected wiring. Replace the cable if broken.
		2) DeviceNet unit is not validated so cannot be identified from controller.	• Refer to "2-5-1 Validating the DeviceNet unit" and check that the DeviceNet unit is properly validated.	• Validate the DeviceNet unit, and turn on the controller power again.
		3) Wrong MAC ID setting.	• Refer to "2-5-3 How to check MAC ID and communication speed" and check the MAC ID.	• Refer to "2-5-2 Setting MAC ID and communication speed" and reset the MAC ID. Then turn on the controller power again.
		4) Wrong communication speed setting.	• Refer to "2-5-3 How to check MAC ID and communication speed" and check the MAC ID.	• Refer to "2-5-2 Setting MAC ID and communication speed" and reset the communication speed. Then turn on the controller power again.
		5) Alarm occurring on controller.	• Connect the HPB and check for an alarm. • Check if the status LED is lit in red.	• Refer to the controller instruction manual and troubleshoot according to the particular alarm.
		6) DeviceNet cable length does not meet specifications for the DeviceNet, or a terminating resistor is not connected.	• Check the DeviceNet cable wiring.	• Repair the wiring.
		7) DeviceNet cable is in proximity to a noise source such as motor/power lines.	• Check the DeviceNet cable installation.	• Reinstall the DeviceNet unit away from the source of noise (motor/power lines.)
		8) DeviceNet unit is defective.	• Replace the DeviceNet unit.	• If this solves the problem, replace the DeviceNet unit.
2	Servo won't turn on.	1) Set to emergency stop as bit 15 of "m" channel input was set to OFF.	• Check bit 15 status of "m" channel input.	• To turn off the servo, set bit 15 of "m" channel input to ON .
		2) Set to emergency stop from HPB or external parallel I/O.	• Check if set to emergency stop at HPB or external parallel I/O.	• Cancel emergency stop on the HPB or external parallel I/O in order to set the servo to on (servo-on).
		3) Controller alarm was issued.	• Connect the HPB and check the alarm that was issued. - Status LED is lit up in red.	• Refer to the controller instruction manual and troubleshoot per the particular alarm.

(continued to next page)

No.	Symptom	Causes	Checkpoints	Remedy
3	Program stops by itself during automatic operation.	1) Error occurred on the DeviceNet system during communication.	• Check if an error has occurred by monitoring the network status information on master PLC.	• Check for any problems with noise or the wiring specifications, and eliminate factors causing errors on the DeviceNet system.
		2) Controller is defective.	• Referring to "2-5-1 Validating the DeviceNet unit", invalidate the DeviceNet unit and try operating the robot separately with the controller.	• If the program stops by itself even during independent controller operation, then the controller is probably defective, so replace the controller.

2-15 Specifications

2-15-1 Unit basic specifications

Spec. Item \ Model	DeviceNet Unit			
Controller models	SRCP/SRCD/ERCX/SRCX/DRCX series controller			
Conforms to DeviceNet Specification	Volume 1 Release2.0 Volume 2 Release2.0			
Device Profile Name	Generic Device (Device Type Number 0)			
Number of nodes used	1 node			
MAC ID setting	0 to 63 (setting by DIP switch on board)			
Transmission speed setting	500K/250K/125Kbps (setting by DIP switch on board)			
Communication data	Predefined Master/Slave Connection Set :Group Only 2 server Dynamic Connections Supported (UCMM) :No Fragmented Explicit Messaging Implemented :Yes			
DeviceNet I/O points *1)	General-purpose inputs 16 points General-purpose outputs 16 points Custom inputs 16 points Custom outputs 16 points			
Parallel external I/O	All points usable as parallel external I/O for controller Each point controllable from master station sequencer (PLC) by emulated serialization, regardless of robot program.			
Network Topology		Maximum Trunk Distance *2)	Maximum Drop Length	Cumulative Drop Length
	500Kbps	100m	6m or less	39m or less
	250Kbps	250m	6m or less	78m or less
	125Kbps	500m	6m or less	156m or less
Monitor LED *3)	Module, Network			

*1) Controller I/O rewrite period is every 10ms.

*2) When thick cables are used. Distance will be short if a thin cable is used or thin and thick cables are used.

*3) The upper lid of the controller must be removed in order to monitor the LED.

NOTE: The product external appearance and specifications are subject to change without prior notice for purposes of improvement or other factors.

2-15-2 DeviceNet specifications

■ General Device Data

Conforms to DeviceNet Specification	Volume 1 Release2.0 Volume 2 Release2.0
Vendor Name	YAMAHA MOTOR CO.,LTD.(Vendor ID 636)
Device Profile Name	Generic Device(Device Type Number 0)
Product Code	1
Product Revision	1.1

■ DeviceNet Physical Conformance Data

Network Power Consumption(Max)	22mA@DC11V
Connector Style	Open-Pluggable
Isolated Physical Layer	Yes
LEDs Supported	Module, Network
MAC ID Setting	DIP Switch
Default MAC ID	1
Communication Rate Setting	DIP Switch
Communication Rates Supported	125Kbps, 250Kbps, 500Kbps

■ DeviceNet Communication Data

Predefined Master/Slave Connection Set	Group Only 2 Server
Dynamic Connections Supported (UCMM)	No
Fragmented Explicit Messaging Implemented	Yes

■ DeviceNet Required Object Implementation

● Identity Object(0x01)

Object Class

Attributes	None Supported
Services	None Supported

Object Instance

Attributes	ID	Description	Get	Set	Value Limit
	1	Vender	○	×	636
	2	Product type	○	×	0
	3	Product code	○	×	1
	4	Revision	○	×	1.1
	5	Status (bits supported)	○	×	bit0 only
	6	Serial number	○	×	each unit
	7	Product name	○	×	YAMAHA ROBOT
	8	State	×	×	
	9	Configuration Consistency Value	×	×	
	10	Heartbeat Interval	×	×	
Services	DeviceNet Services		Parameter Options		
	05H	Reset	none		
	0EH	Get_Attribute_Single	none		

● Message Router Object(0 02)

Object Class

Attributes	None Supported
Services	None Supported

Object Instance

Attributes	None Supported
Services	None Supported

Vendor Specific Additions

	No
--	----

● DeviceNet Object (0x03)

Object Class

Attributes	ID	Description	Get	Set	Value Limit
	1	Revision	○	×	02H
Services	DeviceNet Services		Parameter Options		
	0EH	Get_Attribute_Single	none		

Object Instance

Attributes	ID	Description	Get	Set	Value Limit
	1	MAC ID	○	×	
	2	Baud rate	○	×	
	3	BOI	○	×	00H
	4	Bus-off counter	×	×	
	5	Allocation information	○	×	
	6	MAC ID switch changed	×	×	
	7	Baud rate switch changed	×	×	
	8	MAC ID switch value	×	×	
	9	Baud rate switch value	×	×	
Services	DeviceNet Services		Parameter Options		
	0EH	Get_Attribute_Single	none		
	4BH	Allocate_Master/Slave_Connection_Set	none		
	4CH	Release_Master/Slave_Connection_Set	none		

● Assembly Object (0x04)

Object Class

Attributes	None Supported
Services	None Supported

Object Instance

Section	Description		Information		
	Instance Type		Static I/O Max Instance:1		
Attributes	ID	Description	Get	Set	Value Limit
	1	Number of Members in List	×	×	
	2	Member List	×	×	
	3	Data	○	×	
Services	DeviceNet Services		Parameter Options		
	0EH	Get_Attribute_Single	none		

● Connection Object(0x05)

Object Class

Attributes	None Supported
Services	None Supported
Total Active Connections Possible	1

Object Instance 1

Section	Description		Information		
	Instance Type		Explicit Message		
			Max Instance:1		
	Production Trigger		Cyclic		
	Transport Type		Server		
	Transport Class		3		
Attributes	ID	Description	Get	Set	Value Limit
	1	State	☐	☒	
	2	Instance type	☐	☒	00H
	3	Transport class trigger	☐	☒	83H
	4	Produced connection ID	☐	☒	
	5	Consumed connection ID	☐	☒	
	6	Initial comm. Characteristics	☐	☒	21H
	7	Produced connection size	☐	☒	11H
	8	Consumed connection size	☐	☒	11H
	9	Expected packet rate	☐	☐	
	12	Watchdog time-out action	☐	☐	01 or 03
	13	Produced connection path length	☐	☒	00
	14	Produced connection path	☐	☒	
	15	Consumed connection path length	☐	☒	00
	16	Consumed connection path	☐	☒	
	17	Production inhibit time	☐	☒	00
Services	DeviceNet Services		Parameter Options		
	05H	Reset	none		
	0EH	Get_Attribute_Single	none		
	10H	Set_Attribute_Single	none		

Object Instance 2

Section	Description		Information		
	Instance Type		Polled I/O		
			Max Instance:1		
	Production Trigger		Cyclic		
	Transport Type		Server		
	Transport Class		2		
Attributes	ID	Description	Get	Set	Value Limit
	1	State	○	×	
	2	Instance type	○	×	01H
	3	Transport class trigger	○	×	82H
	4	Produced connection ID	○	×	
	5	Consumed connection ID	○	×	
	6	Initial comm. Characteristics	○	×	01H
	7	Produced connection size	○	×	4
	8	Consumed connection size	○	×	4
	9	Expected packet rate	○	○	
	12	Watchdog time-out action	○	×	00
	13	Produced connection path length	○	×	6
	14	Produced connection path	○	×	20_04_24_01_30_03
	15	Consumed connection path length	○	×	6
	16	Consumed connection path	○	×	20_04_24_01_30_03
	17	Production inhibit time	○	×	00
Services	DeviceNet Services		Parameter Options		
	05H	Reset	none		
	0EH	Get_Attribute_Single	none		
	10H	Set_Attribute_Single	none		

Object Instance 3

Section	Description		Information		
	Instance Type		Bit Strobed I/O		
			Max Instance:1		
	Production Trigger		Cyclic		
	Transport Type		Server		
	Transport Class		2		
Attributes	ID	Description	Get	Set	Value Limit
	1	State	☐	☒	
	2	Instance type	☐	☒	01H
	3	Transport class trigger	☐	☒	82H
	4	Produced connection ID	☐	☒	
	5	Consumed connection ID	☐	☒	
	6	Initial comm. Characteristics	☐	☒	01H
	7	Produced connection size	☐	☒	4
	8	Consumed connection size	☐	☒	8
	9	Expected packet rate	☐	☐	
	12	Watchdog time-out action	☐	☒	00
	13	Produced connection path length	☐	☒	6
	14	Produced connection path	☐	☒	20_04_24_01_30_03
	15	Consumed connection path length	☐	☒	6
	16	Consumed connection path	☐	☒	20_04_24_01_30_03
	17	Production inhibit time	☐	☒	00
Services	DeviceNet Services		Parameter Options		
	05H	Reset	none		
	0EH	Get_Attribute_Single	none		
	10H	Set_Attribute_Single	none		

2-16 Supplement

2-16-1 EDS files

The contents of EDS file 1 are shown below just for your reference.

\$ DeviceNet Configurator Generated Electronic Data Sheet

[File]

DescText	= "YAMAHA ROBOT EDS File";	\$ File Description Text
CreateDate	= 09-19-2000;	\$ File Creation Date
CreateTime	= 12:00:00;	\$ File Creation Time
Revision	= 1.0;	\$ EDS Revision

[Device]

VendCode	= 636;	\$ Vendor Code
ProdType	= 0;	\$ Product Type
ProdCode	= 1;	\$ Product Code
MajRev	= 1;	\$ Major Revision
MinRev	= 1;	\$ Minor Revision
VendName	= "YAMAHA MOTOR CO., LTD.";	
ProdTypeStr	= "Generic Device";	
ProdName	= "YAMAHA ROBOT";	
Catalog	= "";	

[IO_Info]

Default	= 0x0001;	\$ Default I/O Type = Poll
PollInfo	= 0x0001,	\$ Poll Connection
	1,	\$ Default Input = Input1
	1;	\$ Default Output = Output1
Input1	= 4,	\$ Data Size = 4 byte
	0,	\$ All bits are significant
	0x0001,	\$ Poll Connection
	"";	\$ Name String
	6,	\$ Path Size
	"20 04 24 01 30 03",	\$ Path
	"";	\$ Help String
Output1	= 4,	\$ Data Size = 4 byte
	0,	\$ All bits are significant
	0x0001,	\$ Poll Connection
	"";	\$ Name String
	6,	\$ Path Size
	"20 04 24 01 30 03",	\$ Path
	"";	\$ Help String

MEMO

Revision record

Manual version	Issue date	Description
Ver. 3.00	Oct. 2009	Addition of I/O assignment function. Addition of customize function for END output timing in execution of dedicated I/O command. Clerical error corrections, etc.
Ver. 3.01	May 2011	The description regarding "Warranty" was changed.
Ver. 3.02	Jul. 2012	The description regarding "Warranty" was changed.

User's Manual

YAMAHA
Single-axis/Dual-axis
Robot Controllers

SRCD/SRCP
ERCX/SRCX/DRCX

DeviceNet
network board

Jul. 2011

Ver. 3.02

This manual is based on Ver. 3.02 of Japanese manual.

YAMAHA MOTOR CO., LTD. IM Operations

All rights reserved. No part of this publication may be reproduced in any form without the permission of YAMAHA MOTOR CO., LTD. Information furnished by YAMAHA in this manual is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. If you find any part unclear in this manual, please contact your distributor.